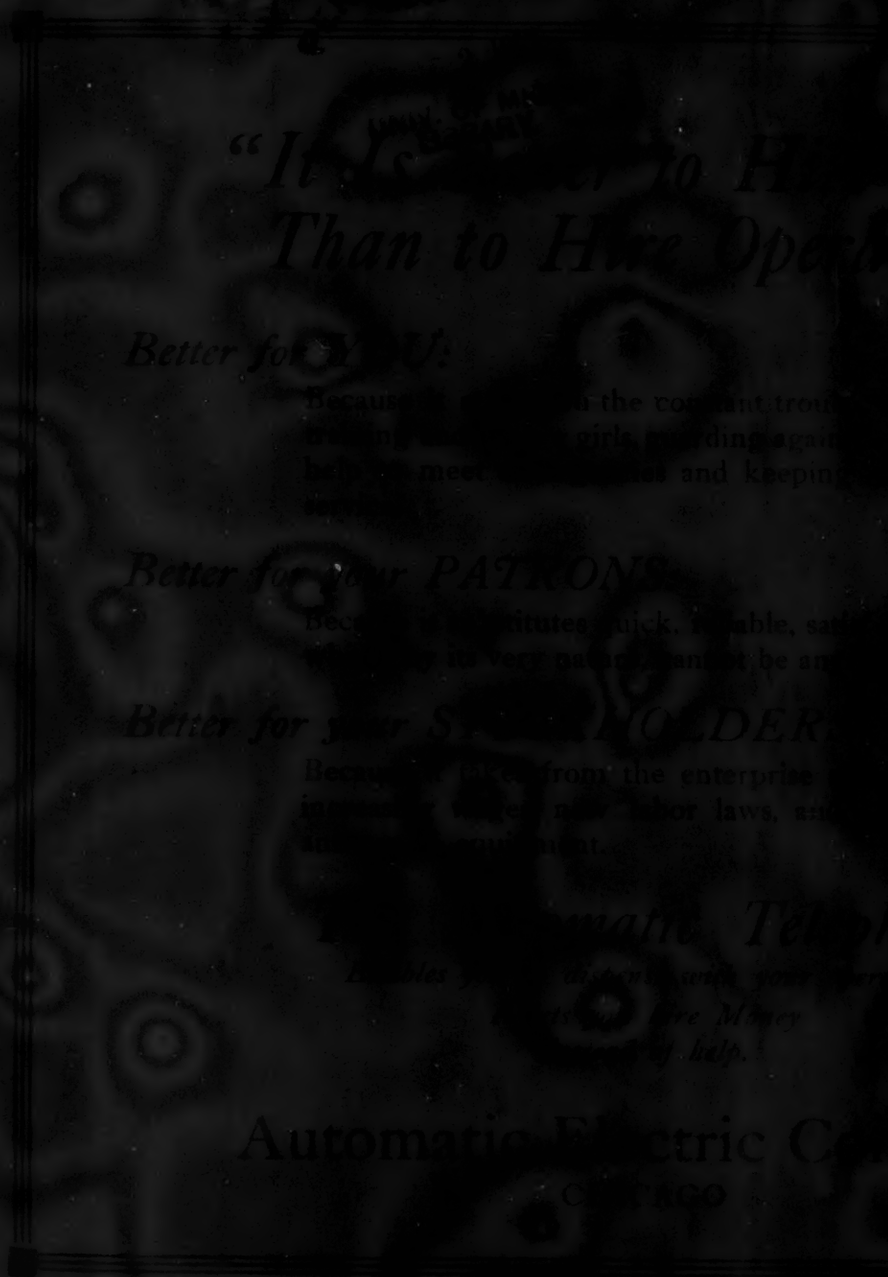
TELEPHONY ENGINEER

Volume XV



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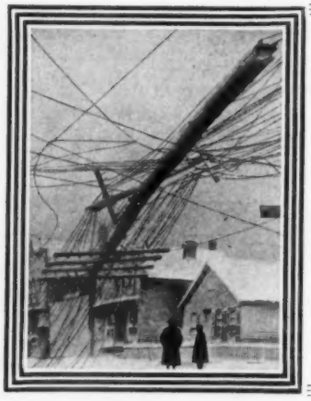

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VOL. XV CHICAGO, MARCH, 1916 NO. 3

The Ethics of Disloyalty

MANY volumes have been written on the secrets of success. Many successful men (we are speaking now, of course, of material success—the accumulation of money and property) have addressed youthful audiences with recipes for achievement. Yet so far as we have seen, the secret has not been published. It could be; there is nothing really occult about it. But we doubt if it would make pleasant reading. It would be subjected to a tremendous storm of abuse and criticism and denial.

There are a good many men who achieve large commercial success by sheer industry and uprightness, maintaining full consideration for the rights of others and following the Golden Rule. Such men must be especially talented. They do not, we fear, establish the rule. Most men who fix their eyes on millions stalk heedlessly over the intervening obstacles of other men's wishes. The man who, without especial gifts, rises to power and wealth against a competitive field, must generally be selfish and even ruthless. Altruism brings happiness, but it does not bring property.

In the main, we recognize the rights of man to selfishness. Business competition we call commercial warfare, and we expect our rivals to take advantage of our weaknesses, and to hinder, not help, our progress. Since the great war started some European philosophers have boldly advocated a policy of supreme selfishness and ruthlessness, in a national sense. Logicians find it hard to combat this theory; for a sentimental, altruistic warfare, or even a kindly, considerate warfare, is too paradoxical for reason.

Except in the forced observance of more stringent rules, there is no essential difference between the interrelations of nations and the interrelations of business competitors. Both seek constantly for diplomatic advantage. If anything, the exponent of business is the less ethical of the two; he seldom gives warning of the opportunity he discovers. That his advantage works to the disadvantage of his friends and associates, as well as his competitors, usually does not deter him. Business first!

Knowing the truth of these things, as we all do whether we ostensibly approve them or condemn them, is apt to make for pessimism. We see business competitors banded together in trade associations whose motto is "co-operation," and we wonder how many members of those organizations are hypocrites, swearing loyalty while they meditate the sacrifice of fellow members for individual gain.

Telephone operators are peculiarly subject to mutual influence. As a telephone is useless without the ability to connect with other telephones, an operating company's horizon is exceedingly limited if it be not allowed to connect with other companies in other communities. In that situation there is no element of competition. A competitor is one who aspires to the same conquests and strives for the same patronage. There is nothing but advantage for both in the interconnection of two companies serving separate communities. And when one operator deprives the other of that advantage by contract with or sale to a third, he violates a moral treaty. There is no question as to the violation; but there is nothing that can be done.

In our unpublished code of business propriety we have given him that privilege. All we can do is to call him hard names, which do not harm him, in the semi-consciousness that we, in some future emergency, may call down upon ourselves the same epithets.

That, we fear, reflects all too clearly the Independent telephone business today. The theory is a harsh one, because it leaves out of account the Independent operators who are not wholly selfish, and who, moved by the spirit of romance that still makes business interesting though we deny its influence, ardently desire the success of the Independent cause and the confusion of its ill-wishers. There are such men in the Independent telephone business. That they can accomplish little, and that little slowly, against the machinations of those who work solely for personal gain, we are forced to concede. Yet if a man choose to place his own accumulation of property and power above the welfare of his business and his associates, we cannot deny him that ambition. The constitution grants him the right to mount on the heads of his fellows, if he can do it.

The telephone business is no worse in this respect than any other business. Those who are wise enough to discover more happiness in working for a cause, an ideal, than in working for ruthless accomplishment, have a century of activity for their opportunity.

We must not regard business intrigue and commercial politics and organization disloyalty as a scandal. We are the hypocrites if we assume that attitude. Any statistician could come to our rescue with proof that out of so many men, so many will be mercenary and disloyal, inevitably. It is our mistake if we fail to insure against that inexorable percentage, which is as certain as the death rate.

Men die and the interests they represent, if they are properly managed, go on without a fluctuation. Men desert to the enemy but the war goes on. The best philosophy is that which characterizes the deserter and the disloyal member as weaklings, better lost than retained. For he who is strong for himself is a weakling for the cause of his associates and adds nothing to his new affiiliation.

The practical and efficient trade association cannot build its future too much on altruism and unselfishness. The more beautiful its theory of organization, the sooner it will come to grief. The wise builders of organizations so arrange their systems that they seem to give much and demand little. They establish effective guards against predatory officers or members, because they know the imminent probability of that kind of activity. They neither try to change business nature nor pretend not to know its characteristics.

Wisconsin Must Make Its Choice

THE Wisconsin Telephone Association has always been admittedly an open and non-partisan society. This makes the more extraordinary the sudden injection of Bell-Independent politics which, apparently, nearly succeeded in wrecking the annual convention last month.

What happened at that meeting, as told on another page, strengthens our conviction that a bi-partisan association cannot do effective work in the present state of trade sentiment. The theoretically desirable friendship of Bell and Independent interests that seemed so interesting to Independent operators a few years ago does not exist.

"Be Bell or be Independent" was the title of an editorial in TELEPHONE ENGINEER some time ago. The Wisconsin association honestly attempted to be both. In theory there is no reason why the idea should not succeed. In practice there seem to be several very active reasons why it should fail.

The Wisconsin fight was a manufacturers' fight. The association still has some Bell members, although the Western Electric Company has withdrawn. But consideration of that question is not ended—it is merely postponed for a year. It would have been better to have thrashed it out on the floor when it came up; though some of the members might have been arguing yet had that been done. As it was, the retiring administration managed to pass the buck to the incoming officers. Next year's convention is apt to be as hot as this one was.

Eventually the Wisconsin Telephone Association will probably become the Wisconsin Independent Telephone Association. It has been suggested that the split would result in the formation of two associations. That is hardly probable as a serious effort. The Bell people do not want a Bell association; they want to be in on the Independent gatherings. The at-

tempt to organize a second association in Minnesota, for example, is not for the purpose of corralling local Bell interests, but to throw Bell influence about as many Independent operators as possible.

That would be the only reasonable object in organizing a second Wisconsin association, if such effort be made.

If the Wisconsin fight had been a revelation of corruption in an ostensibly Independent body, it might be more thrilling. As it is, one feels that the Bell manufacturing interests did rather a diplomatic, if not magnanimous, thing in withdrawing, since they had been admitted to membership.

When the fight started it should have been finished. The Wisconsin association must be either Independent or Bell. There is no middle course left. In an Independent association, of course, the Western Electric Company would not be allowed to exhibit. In a Bell association it would have every right in the world.

The buck is up to the new administration.

Physical Connection Gains Court Approval

THE Wisconsin Supreme Court has sustained the La Crosse physical connection order of that state's railroad commission. That statement in itself is a news story and an editorial.

We are not disposed to predict final court decisions, and this case threatens to be appealed to the United States Supreme Court. It is a pleasure, however, to point in passing to the fact that the state legislature, the commission, the Dane county circuit court and the state supreme court are all in agreement on the subject. Physical connection of telephone lines is held as exactly parallel to physical connection of railway lines.

The Bell companies have contested physical connection cases on the grounds of unconstitutionality, confiscation of property, irreparable injury, and advantage to a competitor. Those who have read the analyses of physical connection which have appeared in these pages from time to time will doubtless agree with us that none of these alleged conditions exists.

With a properly adjusted differential charge, which brief experience will definitely establish and which is contemplated in the commission ruling and in the court order which supports that ruling, the alleged unilateral advantage which is the vital point of the Bell protests becomes nonexistent.

The Bell interests have very good reasons for contesting the application of physical connection.

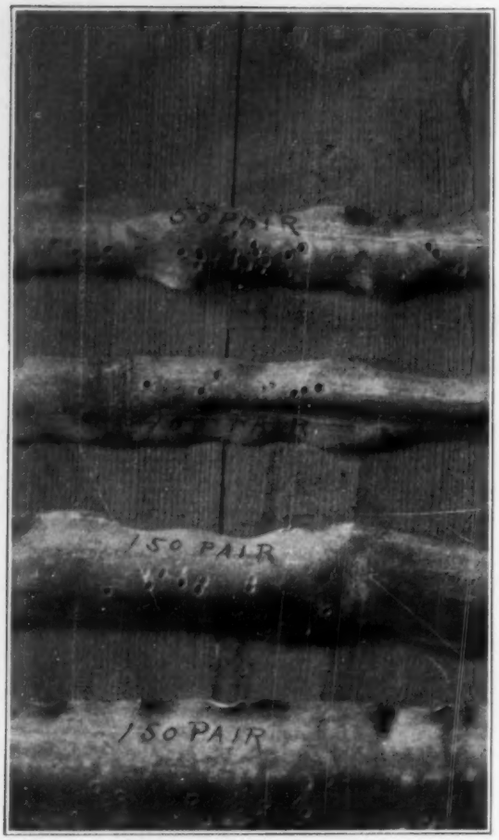
Once established, it extends the scope of both companies concerned in it. The advantage is equal; but the Bell companies would prefer to secure the same result through merger and sublicense arrangements, which would tend to weaken instead of strengthen their competitors.

That, however, is not good argument in court. As a result they are forced into the use of arguments which, though legally more tenable, are logically still worse. We have enough faith in the good sense of our judges to believe in the ultimate total confusion of Bell propaganda against physical connection, and in the establishment of the measure as law.

Physical connection of railway lines, where it was once established, increased the value of railway service to the public tenfold and literally brought order out of confusion. It will have almost the same beneficial effect on the telephone industry and, made national and compulsory, will put new life into the business of giving telephone service.

It will be well to have the United States Supreme Court opinion in this case. That will tend to take it out of Wisconsin and make it a national issue. We are convinced that it means, in time, the interconnection of all telephones all over the country, the end of dual service in all communities, and the advent of the only true "universal service."

For physical connection is the antithesis of monopoly. The very term presupposes the existence of competition, and the purpose to maintain it. That is why the Bell people object to it. That is why all Independents should fight for it, and see that the attorneys who represent it before the highest tribunal lack no legal or logical weapon in its defense.



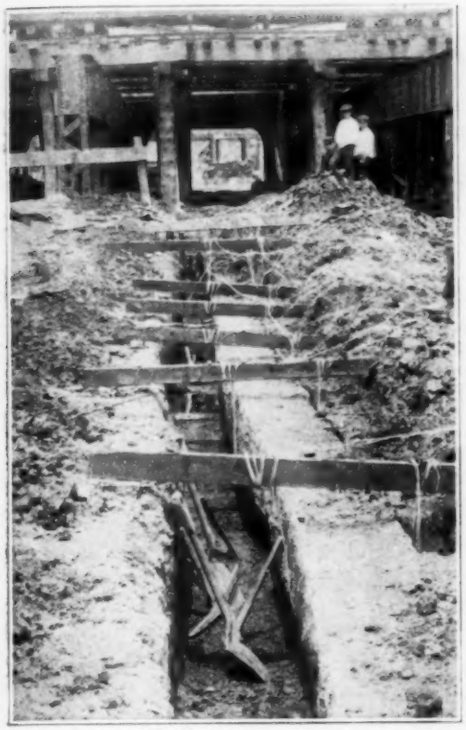
The Illustration on the Left Shows Four Pieces of Cable Sheath Taken from the Pole Lines of the Commercial Telephone Company, and Independent Company Operating at Warsaw, Indiana. The Upper Sheath in the Picture Was Taken from a 50-Pair Cable; the Next Was from a 100-Pair; and the Two Lower Ones Were from 150-Pair Cables. In Warsaw It Is the Custom to Celebrate New Year's Eve by Firing, Anvils, Crackers, Revolvers, Shotguns, or Any Other Noise Producing Weapon That Is Handy. The Damage Done to the Cables Shown Was Accomplished with Two Loads from a Shotgun. Sixty-five Holes Were Neatly Punched in the Four Cables, All Within the Space of Two Feet. And, of Course, the Next Day It Rained—and a Few Telephones Went Suddenly Out of Commission. There Ought to be a Closed Season on Cables.

This and the View on the Opposite Page, Entitled "Cutting a Cable Trench Through Solid Rock," Show Some of the More Arduous Tasks of Construction and Reconstruction. This Picture Shows Cables Temporarily Suspended from Cross-Arms Laid Across the French While Work on the Trench Itself Was Being Completed. This Was in the Territory of the Chicago Telephone Company.

Here Is a View of Some Intensified Joint Pole Line Construction. Strung on These Poles Are Telephone Wires, 4,400 Volt Arc Lighting Wires, 2,300 Volt Primary and 110 Volt Secondary Light and Power Distribution Wires. This Particular View Is at Gladstone, Mich., and G. A. Frogner of That City's Department of Lighting Asserts the Condition Is Far from Unusual. It Is Scarcely in Line with Either Safety First or Service First. Unusual. It is Scarcely in Line with Either Safety First or Service First, and the Lineman Working on Such a Pole Would Surely Need Liability Insurance as Well as Rubber Gloves and Guards.

In an Excavation for a Vault at Broadway and Western Avenue, Joliet, Illinois, the Chicago Telephone Company Encountered Ten Feet of Solid Rock. Blasting was Rendered Hazardous by the Presence of a Gas Main, a Water Main and Chicago Telephone Company Cables in the Old Conduit Run Close By. Groundmen Good and Little Were Employed on this Work, Explains the Bell Telpehone News, from Which the Photographs Were Borrowed, Because the Results of a Day's Digging Were Good and Little.

STORIES OF PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.

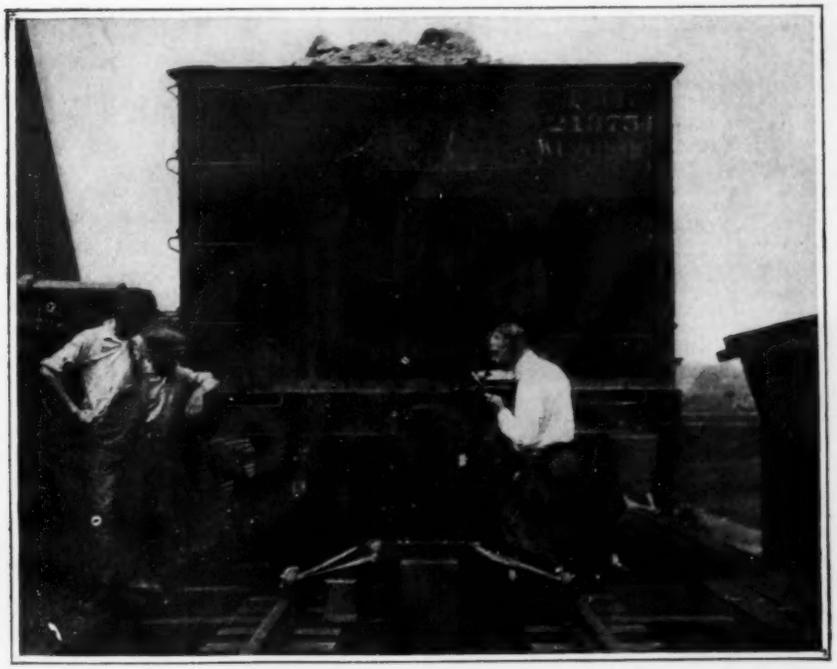


Cutting a Cable Trench Through Solid Rock—An Operation of the Chicago Telephone Company. Within Chicago City Limits.

Elevator Runner in the Woolworth Building. New York.

Elevator Runner in the Municipal Building, New York.

Elevator Dispatcher in the Municipal Building. New York.



A Philadelphia Man, W. W. MacFarland, Has Been Conducting Experiments in the Use of Railroad Tracks As Conductors for Telephonic Communication. Conversations Over the Steel Rails of the Pennsylvania Railroad Have Been Held Between New York and the Experimental Station Near Philadelphia, and Then Relayed to the Local Bell Wires. The Electric Current Used, Instead of Passing Through the Wheels and Axles of the Rolling Stock Standing on the Tracks, Which Offer a Shunt Path of Fairly Low Resistance, Will Pass in Sufficient Strength Through the Apparatus to Satisfactorily Perform the Task Set for It. This Is Brought About by Furnishing a Path of Least Resistance to the Current. In the New System, Current Is Conducted from the Rails to the Cab of a Locomotive by Means of a Shoe of Copper Held in a Steel Frame and Resting Upon Each Rail. The Current, in Addition to Rendering Telephonic Communication Possible, Can be Used for Other Purposes, Particularly for Signaling. —Scientific American.

Elevator Dispatcher in the Woolworth Building.

To Facilitate the Operation of Elevators in Office Buildings, an Elevator Telephone System Has Recently Been Designed by the Western Electric Company. In All of the Buildings in Which It Has Been Installed It Has Proved Remarkably Successful. The Means for Instant Communication Is the Special Feature Which Makes Possible the Satisfactory Dispatching of the Elevators. To Talk to the Operator the Dispatcher "Plugs In" on That Line and Uses the Loud-Speaking Receiver.

On Burying Cable Lines

Editors Telephone Engineer:—I take off my hat to E. E. Daicey, manager of the South Bend Home Telephone Company, on the nerve displayed in his speech at San Francisco as published in your February issue.

To my knowledge, he is the first man with sand and backbone enough to make public admission to laying cable underground without conduit.

Mr. Daicey is one of the best telephone men in Indiana. His opinion on any subject has great weight. He is an independent and conservative thinker and consequently does not plunge headlong into any matter without due investigation.

We who know the man will not be shocked to learn that he may have taken a radical stand, or what might so seem to the average man, on any of the old ways of doing things.

Mr. Daicey is always looking for and willing to give full consideration to any new thought or scheme and will try it once himself if there seems any possibility of success.

He has declared himself on underground cable, and you can bet the gentleman from Indiana has some valuable information on what happens to cable sheath when laid in various kinds of dirt or soil permeated with different salts and alkali. Just a word of caution—be careful which kind of a "haw-haw" you let loose, for this man is strong on the come-back.

It is really comical how touchy and "secretive" all we fellows have been and are on the question of laying cable underground without protection. Daicey has now blazed the trail and we think the nigger in the wood pile will show himself and you will hear much about this subject.

About two years ago the writer attended a convention in a neighboring state. A man from Illinois was confidentially telling a friend about having laid 6,000 feet of cable unprotected. Having overheard the conversation, I butted in for more information. The gentleman reluctantly gave me information concerning the work, but seemed ashamed of what he had done, and I felt sorry for him. The cable had been down six years. Like all skeptics I did not know when to quit and asked him what condition the sheath was in at this time.

He looked at me sheepishly and replied: "I don't know. Never had occasion to dig it up." I guess his reply put the blocks on further questions: Six thousand feet of cable, in service six years and not a case of trouble. Can you beat it?

I concluded this man did not need my sympathy.

He is a pioneer, a man who after due thought and investigation is willing to back his judgment with his job, calmly listens to the laughs and jeers and looks to the future for vindication.

This stick-in-the-mud cable proposition clung to me. I could not shake it off. The same night on my way home from the convention I could hardly wait to spring it on a certain large Ohio operator who occupied the seat with me. This manager dodged my questions like a gun-shy dog. I had almost reached the point of exhaustion when he loosened up and told me his company was preparing to lay 10,000 feet without protection.

The writer made further investigation after reaching home.

Fortunately the gas and water companies were removing pipes due to street improvement. After 30 years of service, expansion and contraction, these pipes were as good as new and were again used.

Concluding our conditions and soil was suitable, we laid 400 feet for experimental purposes. Did we tell about it? Not until some manager confidentially told us about his work. Since a few brave men have come out and now declare their intention of continuing the practice, it is no longer hard to get information. You can even find men who take pride in the fact that they commenced the practice five or six years ago.

Mistakes have been made. For instance, a small company laid a heavy, green oak plank over the cable for protection. Acid formed by water from the oak ruined the sheath. The cable was replaced covered with tar paper and two inches of concrete.

The writer knows of about 50,000 feet of buried cable and of 10,000 feet that will go in this year.

Should the practice show signs of being extensively adapted by small cities and towns great volumes of advice will be submitted.

We can expect criticism and opposition to this scheme of placing cables. It cuts into the business of the supply houses and conduit manufacturers.

The writer's investigation does not reveal trouble having been experienced except where poor judgment in laying was displayed.

Now loosen up, you fellows who have had cable so laid for years, and acknowledge the goods. You are not the only stick-in-the-mud cable layers. Give us your experience. Tell us all about just how you did the work, how long cable has been down and what trouble you have experienced, if any. Would you so lay your cable again?

We want your experience. Thousands of dollars can be saved by adopting this scheme where conditions are suitable, or it may be conclusively shown to be bad. J. W. Scott.

Iowa College Giving Telephone Course

Under the auspices of the Engineering Extension Department of the Iowa State College, telephone men gathered in Creston, January 20, to attend a two days' school to learn the latest things in telephone management and operation. Only a registration fee of a dollar was charged to cover the cost of the lesson material used.

This kind of short course was started last spring at the request of the Iowa Independent Telephone Association which recognized the importance of improving telephone service in Iowa which has more telephones per thousand of population than any other state. The course of instruction worked out in cooperation with practical men does not deal with the theory of telephone engineering but is designed especially for the practical man in the small plant who strings wires, shoots trouble and keeps the nerves of commerce in working order. The topics covered were "Telephone Apparatus," "Use of Testing Instruments in Locating Faults on Telephone Lines," "Cable Installation and Maintenance," and "Telephone Transmission."

The instructors were men of practical experience and in their demonstrations they used the real thing in testing sets, transmitters, cable sections and all other kinds of telephone apparatus. A. B. Campbell was in charge of the school, assisted by Prof. C. A. Wright and G. L. Saunders of the Interior Telephone Company of Grinnell.

A. T. & T. Borrows $50,000,000

The American Telephone and Telegraph Company has sold to J. P. Morgan & Co. $50,000,000 4½ per cent two year notes. It is understood that all of these notes will be retained by the Morgan firm and its associates and that there will be no public offering. The proceeds of the note sale will be devoted to the taking up of some $30,000,000 notes of subsidiary companies, which fall due this year. This will leave the company with about $20,000,000, which may be devoted to extensions, improvements or other uses to which the officers of the company may see fit to put the money. Some of the notes are direct obligations on the American Telephone and Telegraph Company, while others are obligations of its subsidiary properties, indorsed and guaranteed by the company.

Novel Installation at Dayton Exposition

At the Industrial Exposition held at Dayton recently, the Ohio State Telephone Company had a very novel and complete telephone system installed where every exhibitor could be reached at his respective booth on the Home telephone. Not only could the exhibitors be reached by persons using city telephones in any part of Dayton, but they were enabled to use their telephones in keeping in touch with their business offices and communicating with persons both in and out of the building. This private automatic exchange was under the general supervision of general manager Allen W. Surrell.

U. S. I. T. A. Is Bell Influenced, Says Allen

Apparently Not Wholly Independent, Director Asserts—Hubbell Asks Body Not to Block His Sale

TERRY W. ALLEN, one of the thirty-one directors of the United States Independent Telephone Association, at a directors' meeting held at Chicago on January 22, according to his own admission attempted to "tilt the lid" and place the organization "squarely on and not astride of the Independent telephone plank."

Mr. Allen declares he found the anti-Independent lid clamped on pretty tight, and with the assistance of three or four directors who placed themselves on record as being truly "Independent" he didn't accomplish a great deal.

During this meeting Director Hubbell resigned, announcing that he expected to sell his telephone properties to the Bell interests.

Here are the things Mr. Allen declares he learned at the first meeting of the directors of the organization following its formation last December:

The majority of the directors are not sincere in their demands that the government enforce the law to prevent the Bell and its allies from taking over competing Independents.

Certain interests in the Association are working for star chamber sessions to prevent what happens at the meetings from being made public.

There is an under-current of sentiment in the Association which appears to have control and which appears to be working for Bell interests, but the connection, if there is one, is so carefully disguised that it cannot be declared as a fact. Legal proof, he says, is missing, but the moral proof is too strong to disregard.

That the United States Independent Telephone Association is far from being what it pretends is the conclusion arrived at by Mr. Allen after a careful survey of what happened at the meeting. But he also contends that he will remain as a member of the Association in order that he may ascertain what goes on behind the scenes, whereas he would be left entirely in the dark should he withdraw.

That the Association is lax in its duty or is deliberately endeavoring to play into the hands of the American Telephone and Telegraph Company by not advising the Independents to support the Borah resolution which provides for a congressional investigation with a view of determining between regulation and government ownership of telephone and telegraph lines.

The resolution of Senator Borah passed the Senate late in February and now is before the House.

In discussing this resolution Mr. Allen declared that the Bell interests are doing everything in their power to cement opposition to the resolution.

"Every Independent in the country should support it," said Mr. Allen. "The Independents can afford to support it. They have mighty little water in their properties. The Bell interests oppose it because when the water is squeezed out of their property they cannot face a fair valuation test.

"The Association is on record as advocating delay. It is the same with everything in which the Bell interests might be scratched. Some interest in the United States Independent Telephone Association works for 'delay.'

"Every Independent in the country should work for the passage of the Borah resolution and prove that their plants can stand a fair valuation, which is more than I can say for the Bell system."

This is the substance of the resolution discussed:

The committee (a joint body from the Senate and House) are appointed to investigate also the subject of government ownership of all public utilities, such as telegraph, telephone, express companies, and railroads engaged in interstate and foreign commerce and report as to the wisdom or feasibility of government ownership of such utilities and as to the comparative worth and efficiency of government regulation and control as compared with government ownership and operation.

To prove that he will not abide by any political methods and that he will not be muzzled by any star session agreements, Mr. Allen furnished TELEPHONE ENGINEER with a report of what happened during the discussion at the directors' meeting when every other door of information was closed.

Hubbell Announces Bell Contract and Resigns

B. G. Hubbell, president of the Federal Telephone & Telegraph Company, of Buffalo, N. Y., and also a director of the United States Independent Telephone Association, proceeded to throw a monkey wrench into the Independent telephone works when he announced that he had in the making a contract through which he would sell his company to the Bell interests. He made this announcement and requested that the United States Independent Telephone Association refrain from placing any legal obstacle in the way of the consummation of the contract. Mr. Hubbell also tendered his resignation.

The discussion started with the tendering of the resignation, and the camp immediately was divided. Several of the directors took the stand that Mr. Hubbell had not turned over his properties to the Bell interests and therefore still was eligible not only as a member but as a director of the Association.

Debate was cut off by a motion to table the resignation, and few had a chance to express their views. A vote was taken, and giving the vote from memory only, just four directors cast their vote in favor of accepting the resignation. These men were W. Roy McCanne of the Stromberg-Carlson Telephone Company, H. Linton Reber of the Kinloch Telephone Company, J. B. Earle of the Texas Telephone Company, and Terry W. Allen of the Allen Properties.

A. F. Adams of the Kansas City Home Telephone Company, and C. Y. McVey, president of the Association, an official of the Ohio State Telephone Company, requested to be excused from voting on the question.

The balance of the twenty-four directors, under the leadership of F. H. Woods of the Lincoln Telephone Company, desired to have Mr. Hubbell remain as a director of the Association apparently. In explaining this vote, however, Mr. Allen stated that there may have been two or three of the directors present who did not understand upon what they were voting. He declares that he believes that had George W. Robinson of the Tri-State Telephone & Telegraph Company, and William H. Bryant of the Home Telephone Com-

pany of Mobile, and possibly others, understood the question they would have been recorded as in favor of accepting the resignation.

More important than accepting the resignation of Mr. Hubbell, according to Mr. Allen, was Mr. Hubbell's request that the Association place no legal stumbling block in the path of the sale of his company to the Bell interests.

At a meeting of the executive committee of the Association held in Chicago on January 8 last a resolution was adopted. It read:

Resolved, That the officers of this Association be instructed to see that the provisions of the American Telephone and Telegraph Company commitment to the Department of Justice, dated December 19, 1913, be adhered to; and that the officers be instructed to secure all the information they can concerning any violation or any attempted or suspected violation and that such information be reported to the board of directors of this Association for instruction.

The request of Mr. Hubbell that the Association place no obstacle in the way of the sale of his property, according to Mr. Allen, is in direct violation of the resolution passed by the executive committee.

The verbal battle over the resignation of Mr. Hubbell consumed most of the morning session. During the lunch hour those directors in favor of keeping Mr. Hubbell as a director reconsidered and at the afternoon session the resignation was unanimously accepted.

H. L. Gary of Kansas City was elected to the directorate in place of Mr. Hubbell. John H. Wright was mentioned, but not nominated.

Further to place the directors on record on enforcing the resolution passed by the Executive Committee, Mr. Allen had the attention of the board to the transfer of the Independent telephone properties at Chipley, Florida, to the Bell interests for a consideration of something between $50,000 and $80,000. Mr. Allen demanded that the Association take action in the matter and Secretary MacKinnon reported that he had investigated the case and that to him "it appeared to be a violation of the Bell commitment."

Mr. Allen had been in correspondence with Assistant Attorney General G. Carroll Todd in an effort to have something about the sale of this property.

"Todd wrote to MacKinnon that I was a liar," said Mr. Allen, "and the Association immediately refused to request the attorney general of the United States to take official action.

"This action to my mind proves beyond all doubt that certain members of the United States Independent Telephone Association do not care how strong the Bell gets at the expense of the Independents."

On the vote that Attorney General Todd be requested to investigate and take some action the four directors who wanted action and so signified by their vote were Allen, Bryant, Reber and Uhl. Eventually a resolution was adopted to send Mr. MacKinnon's report to the assistant attorney general, but without recommendation.

"Oh, pshaw!" Mr. Allen remarked. "That is only for the purpose of delay. We have investigated. Vice-President MacKinnon has reported that the transfer is a violation of the commitment. Why not say so? That is just a stall to give the Bell people more time to strengthen their fences."

During the meeting J. B. Earle, president of the Texas Telephone Company of Waco, Texas, suggested that every director give a pledge that he would take no action in any matter without first having submitted the facts to the directors. H. Linton Reber immediately announced that he would not be bound by any such rule and that he purposed to run his company as he saw fit and without submitting his plans to any Association board of directors. Mr. Earle did not put his suggestion into resolution form after he saw the amount of opposition he had raised.

Of the thirty-one members of the Board of Directors twenty-four were present. The absentees were:

P. C. Burns, American Electric Company, Chicago.

J. C. Casler, Dallas Automatic Telephone Company, Dallas, Tex.

A. B. Cass, Home Telephone and Telegraph Company, Los Angeles, Cal.

E. M. Cooke, Keystone Telephone System, Philadelphia, Pa.

L. D. Kellogg, Kellogg Switchboard and Supply Company, Chicago.

Albert Parlett, Bristol Telephone Company, Tenn.

William Fortune, Indianapolis Telephone Company, Indianapolis, Ind.

The directors who took part in the stormy meeting were:

A. F. Adams, Kansas City Home Telephone Company, Kansas City, Mo.

T. W. Allen, president Jackson Home Telephone Company, Jackson, Tenn.

F. L. Beam, president Mt. Vernon Telephone Company, Mt. Vernon, Ohio.

A. G. Bean, vice-president and general manager Garford Manufacturing Company, Elyria, Ohio.

W. H. Bryant, vice-president and general manager Home Telephone Company, Mobile, Ala.

H. D. Critchfield, Automatic Electric Company, Chicago.

J. B. Earle, president Texas Telephone Company, Waco, Tex.

E. B. Fisher, president Independent Telephone Association of America, Grand Rapids, Mich.

Geo. R. Fuller, Rochester Telephone Company, Rochester, N. Y.

W. F. Goodrich, secretary La Crosse Telephone Company, La Crosse, Wis.

S. M. Heller, general manager Central Home Telephone and Telegraph Company, Louisville, Ky.

P. C. Holdoegel, Central Mutual Telephone Company, Rockwell City, Iowa.

B. G. Hubbell, president Federal Telephone and Telegraph Company, Buffalo, N. Y.

F. B. MacKinnon, vice-president United States Independent Telephone Association, Washington, D. C.

W. Roy McCanne, treasurer Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y.

S. G. McMeen, president Ohio State Telephone Company, Columbus, Ohio.

C. Y. McVey, Ohio State Telephone Company, Cleveland, Ohio.

H. Linton Reber, vice-president and general manager Kinloch Telephone Company, St. Louis, Mo.

G. W. Robinson, president Tri-State Telephone and Telegraph Company, St. Paul, Minn.

E. D. Schade, general manager Johnstown Telephone Company, Johnstown, Penn.

C. E. Tarte, general manager Citizens Telephone Company, Grand Rapids, Mich.

W. J. Uhl, secretary and general manager Logansport Home Telephone Company, Logansport, Ind.

W. S. Vivian, secretary and treasurer United States Independent Telephone Association, Chicago.

F. H. Woods, president Lincoln Telephone & Telegraph Company, Lincoln, Neb.

Inasmuch as from time to time the Association will be asked to meet committees representing other utility organizations in connection with legislative matters, the following committee was appointed to represent the U. S. Association at such conferences: F. B. MacKinnon, of Washington, D. C., P. C. Holdoegel, of Rockwell City, Iowa, and E. D. Schade, of Johnstown, Pa.

After receiving the reports of committees and attending to other routine work, the board adjourned to meet at the call of the president.

Battle Rages at Wisconsin Convention

Independents Rise Up and Demand Western Electric Scalp

BY NAT S. STRONGE

THE Independent and Bell telephone babies, metaphorically speaking, have been occupying the same crib in the deliberations of the Wisconsin State Telephone Association. But at the annual convention of the Association, held at Madison February 9, 10 and 11, they just raised cain. They tore the sheets, threw the nursing bottles through the window, scratched each others' faces and decided that hereafter they would demand separate cribs.

After the fight was over outwardly the Association showed the same calm appearance as heretofore but inwardly it is torn from stem to stern, with the almost certain result that sooner or later there must be two Associations in Wisconsin—one Independent and the other Bell.

The battle started during the second day of the convention when the Independent switchboard manufacturers, through their representatives, demanded that the Association bar the Western Electric Company from the privilege of exhibiting at the convention.

For the first time in many years the Western Electric Company had an exhibit on the second floor of the New Park Hotel, rubbing elbows with the exhibits of the Independent manufacturers.

As explained by J. F. Sweeney, representing the Western Electric Company, his corporation had a perfect right to exhibit and take orders, as the Western Electric Company was a member of the Wisconsin State Telephone Association, which always has been looked upon as the meeting ground for Independent and Bell alike.

Before the demand of the representatives of the Independent switchboard manufacturers could be acted upon A. M. Collins, representing the Western Electric Company, presented the resignation of his company as a member of the Association. In doing so he explained that this action was taken for the good of the Association and for the preservation of the organization. He realized thoroughly that those companies affiliated with the Bell and Bell sub-licensees would immediately withdraw from the organization. This action on the part of Mr. Collins prevented a bitter fight on the convention floor, but did not prevent the tearing open of old sores.

Had the Association refused to accede to the demands of the Independent switchboard manufacturers the representatives of the manufacturers were prepared to present a notification that they would not exhibit nor take any part in future conventions of the Association and would not assist in its support in any manner. The action taken by the Western Electric representatives made this notification unnecessary.

As a direct result of the fight W. L. Smith of Neillsville, president of the Association, refused to stand for re-election as a director, and P. J. Weirich, for many years secretary of the Association, was not re-elected. Both of these men are looked upon as followers of the Bell interests.

George H. Crandall, who had charge of the exhibit of the Garford Manufacturing Company, was the leader in the fight against the Western Electric interests. In the fight he had the able assistance of A. J. Carter of the Kellogg Switchboard and Supply Company.

The Garford representative opened his skirmish by making a canvass of the exhibits, requesting all the Independents to sign the petition demanding the ousting of the Western Electric Company. In this he found that there was a lack of unanimity. Several of the exhibitors refused to endorse the demands. The representatives of W. N. Matthews & Brother, Cox Lightning Arrester Company, S-R Electric Company, Reliable Electric Company, Fibre Conduit Company and Utilities Indemnity Exchange would not sign the petition.

The petitioners then were limited to the representatives of the Independent switchboard companies and those who signed were:

George H. Crandall, Garford Manufacturing Company;

F. A. Cannon, Stromberg-Carlson Telephone Manufacturing Company;

E. L. Brown, American Electric Company;

G. O. Wilson, Monarch Telephone Manufacturing Company;

A. J. Cohn, Cracraft, Leich Electric Company;

W. H. Lawrence, Julius Andrae & Sons Company;

W. L. Curtis, Automatic Electric Company.

As presented to the Association the petition read:

The Independent telephone manufacturers, believing that there are certain practices being countenanced by the Wisconsin State Telephone Association that are inconsistent and unfair to said Independent telephone manufacturers, earnestly call your attention to some of the things, as follows:

After about 18 years of monopoly, the Bell-Western Electric combination had a development throughout the United States of approximately 325,000 telephones, with thousands of communities without any service or with inadequate service. Many of these communities, realizing something of the benefits of the telephone, wanted service; but in most cases when such requests were made known to Bell-Western Electric officials, they received little or no encouragement and scant consideration.

Failing to get the service from the only known source—the Bell-Western Electric combination—they proposed to organize local companies with local capital and buy their equipment; but even this was denied them by the Bell-Western Electric. Not a telephone or a pair of cords would they sell. In addition, they were told if they organized, invested their money and attempted to give telephone service, they would be crushed out of existence and would be made to lose every dollar so invested.

With true American spirit many promptly engaged in the telephone business. This created a demand which rapidly spread throughout the country and, of necessity, brought into existence Independent telephone manufacturers. Immediately the Bell-Western Electric combination harassed and annoyed the Independent operating and manufacturing companies in every conceivable manner, even going so far as to burn Independent apparatus at public fires as a warning. Patent litigation was started against both operating and manufacturing companies which threatened their very existence, but by means of associated effort and at great expense the Berliner and other patent cases were won and it was made possible for the Independent companies to remain in the business.

During the years that have since passed, the Independent telephone manufacturers have been an important factor in the growth and development of Independent telephony. Freely and generously have they assisted the several local, state and national Independent telephone associations, in both money

and time and effort. Many are the operating companies who were befriended and given long-time credit by the Independent telephone manufacturers when they could not purchase anything from the Bell-Western Electric combination for cash, to say nothing of credit.

The Independent telephone manufacturers, therefore, do not think it fair that the Bell-Western Electric combination, which controls exclusively 60 per cent of the market, should be extended the privilege of selling its wares to the Independent telephone companies whom it previously tried to exterminate and whom it yet hopes to exterminate, and to whom it is fundamentally opposed at the present time, when the Independent telephone manufacturers are not permitted to sell to the Bell companies. Recent court investigations in the Central Union case, which are matters of record, clearly show the unfair position of the Bell-Western Electric combination in this matter.

Its avowed policy is, "One system, one policy and universal service," which if carried out will mean the extermination of locally-owned telephone companies and Independent telephone manufacturers. Therefore, believing that these conditions are unfair, unjust and un-American, we, the undersigned Independent telephone manufacturers, respectfully request and urge the Wisconsin State Telephone Association to take such action at this meeting as may be necessary to eliminate the Bell-Western Electric combination from exhibiting or taking part in future meetings of your association.

Great secrecy was followed in the preliminary skirmish, which was in charge of W. S. Vivian, secretary of the United States Independent Telephone Association, who drew the petition and attempted to grease the ways for its favorable consideration.

It was presented on the floor of the convention by George H. Crandall and came as a bombshell to President Smith, who knew nothing of the matter until he started to read the petition.

He looked over the petition and then gasped for breath.

"Gentlemen," he announced, "you are taking an unfair advantage of the chair. You are endeavoring to compromise me."

But the petition was convention business and the men behind the movement were ready to fight for favorable action and the ousting of the Western Electric Company.

The petition was referred immediately to the resolution committee, which was in control of the Independent element of the Association. It was reported almost immediately with a favorable recommendation.

J. C. Crowley, of Superior, led the fight on the floor for favorable action immediately.

Ed J. Luis, of Eagle, fought for delay, declaring that it was far too important a matter to be considered hastily. In this he was supported by President Smith and Secretary Weirich, both of whom asserted that the subject was a matter for a roll call and that in the absence of a report from the credentials committee it was impossible to determine the names of the members in good standing and entitled to vote. On this explanation the petition was made a special order for the following morning.

That night was a wild one in the corridors of the hotel. It looked more like a political than a telephone convention. J. C. Crowley was busy lining up his adherents to jam through the petition and accede to the demands of the Independent manufacturers.

J. F. Sweeney, A. M. Collins, G. E. Brown, D. H. Frick and A. R. Maynard, representing the Western Electric Company, were equally busy in lining up their followers. In this the Western Electric representatives were in a trifle better strategical position, as they had the active support of Secretary Weirich, who was in possession of the list of members in good standing.

Until long into the night Weirich and the representatives of the Western Electric Company checked the membership list with the result that they found they apparently were three votes short of the necessary number to prevent favorable action on the petition.

In checking they placed in their column only the names of men with pronounced Bell leanings and gave credit to the other side of the doubtful ones.

It was not until a few moments before final action was to be taken upon the petition that the Western Electric representatives felt assured that they lacked enough votes to prevent their ousting.

They kept their own counsel and the announcement that they desired to resign from the Association caused almost as much consternation as the original action aimed at them. The resignation shut off floor discussion.

Later the fight was renewed during the election of officers. The tenure of office of President Smith, as a director, expired and he announced that he would not stand for re-election. In making the announcement he said:

"After making a tour of this state I find that many of the telephone companies feel that this Association is dominated by a clique and has been dominated by a few men for several years. These companies will not join, so I will not stand for re-election. As the representative of the Wisconsin Telephone Company I desire to thank you for the manner in which you have treated me."

H. H. Christofferson, of Colby, a simon-pure Independent, was elected as a director in place of President Smith.

With the disposal of President Smith the Independents opened their guns on Secretary Weirich. The Independent directors were ordered to go to the meeting and oppose the re-election of Weirich and to accept his resignation in a hurry if he tendered it. Mr. Weirich did tender his resignation and, in justice to him, it must be said that he had intended such action before the Independent-Western Electric fight appeared upon the horizon.

F. H. Runkel, of Portage, was re-elected a director and later was elected president of the Association; Walter J. Gallon, of Sheboygan, was elected secretary in place of Mr. Weirich. W. F. Goodrich was elected treasurer and H. H. Christofferson, vice president.

As put by W. F. Goodrich, of La Crosse, "the fight certainly put some 'pep' in the convention," but aside from that the meeting was above the standard of ordinary conventions.

Much of the discussion was confined to the two big bones of contention in the telephone business—the rate operating companies shall receive from the Bell companies for toll line connections and the best method of forcing collections.

In an effort to eliminate the first trouble a resolution was adopted calling upon the president to appoint a committee of five to confer with the Wisconsin Railroad Commission and request that the commission investigate and fix a basis of payment which will be more equitable than the 15 per cent for originating business now allowed by the Wisconsin Telephone Company.

The collection problem was approached by the passage of a resolution requesting that the Wisconsin Railroad Commission order an advance in telephone rates of 25 cents a month which shall be given as

rebate when telephone users pay their bills promptly and which shall revert to the companies in case of delinquent accounts.

The convention opened on the afternoon of February 9 with an address of welcome from Mayor A. H. Kayser, of Madison, and by C. L. Miller, district manager of the Wisconsin Telephone Company at Madison, which were responded to on behalf of the Association by J. C. Crowley, of Superior.

After the usual presidential address by W. L. Smith, a paper on "Methods Employed in the Valuation of Physical Properties" was read by C. M. Larson, Railroad and Utilities Engineer of the Wisconsin Railroad Commission. It appears in full on another page.

During the convention other papers, as follows, were read:

"Service," by W. S. Vivian, secretary of the United States Independent Telephone Association.

"Placing the Telephone Business Before the Public," by F. H. Runkel.

"The Help Question," by Walter J. Gallon.

"The A. B. C. of Telephone Accounting," by J. M. Storkerson.

"Cost of Service as a Basis for Rate Making," by Halford Erickson, chairman of the Wisconsin Railroad Commission.

"What the Net Rate of Interest Should Be," by E. J. Kneen.

"Keeping Step With the Times," by H. N. Tolles, vice president, the Sheldon School (printed in January TELEPHONE ENGINEER).

President Charles R. Van Hise, of the University of Wisconsin, was the speaker of the evening at the annual banquet. He spoke on "The University and the State."

On the closing day of the convention the members journeyed to the laboratory of the University of Wisconsin, where they heard an illustrated lecture by Prof. Earl M. Terry on "The Electric Wave and Its Propaganda." During the lecture two wireless messages were received at the Wisconsin station from the Arlington station at Washington, D. C. One was signed by Josephus Daniels, secretary of the navy, and the other by F. B. MacKinnon, vice president of the United States Independent Telephone Association. They were messages of greeting and good fellowship to the members of the Wisconsin State Telephone Association.

The convention closed with a transmission demonstration from Madison to San Francisco through the courtesy of the Wisconsin Telephone Company. The banquet hall had been fitted with one hundred sets of instruments and the Wisconsin members talked with telephone men at San Francisco.

Those who registered at the convention were:

J. F. Holland, Aubundale Telephone Company, Aubundale, Wis.

N. M. Berg, Aubundale Telephone Company, Aubundale, Wis.

C. A. LaVassor, Argyle Telephone Company, Argyle, Wis.

R. W. Bowen, Augusta Telegraph and Telephone Company, Augusta, Wis.

L. H. Palmer, Farmers Mutual Telephone Company, Baraboo, Wis.

A. A. Michaelson, Black Earth Telephone Company, Black Earth, Wis.

Jacob Christ, president, Boscobel Telephone Company, Boscobel, Wis.

J. B. McMullin, Electric Appliance Company, 701 West Jackson boulevard, Chicago, Ill.

J. M. Moore, F. B. Cook Company, Chicago, Ill.

W. S. Miller, Central Wisconsin Telephone Company, Black River Falls.

Dr. H. H. Christofferson, Clark County Telephone Company, Colby, Wis.

Egbert Wyman, Crandon Telephone Company, Crandon Wis.

F. W. McKinney and J. M. Jacobson, Clinton Telephone Company, Clinton, Wis.

F. L. Eldridge, Kellogg Switchboard and Supply Company, Chicago, Ill.

A. M. Collins, Western Electric Company, 500 South Clinton street, Chicago, Ill.

N. S. Stronge, TELEPHONE ENGINEER, Chicago, Ill.

E. J. Kneen, New Cashton Telephone Company, Cashton, Wis.

E. A. Johnson, Columbia County Telephone Company, De Forest, Wis.

Moneaer, Chas. Watzke, Black Earth, Wis.

Geo. W. Rodormer, Reliable Electric Company, Chicago, Ill.

Frank P. Kennedy, Illinois Electric Company, Chicago, Ill.

E. I. Bates, Chippewa County Telephone Company, Eagle Point Exchange, Chippewa Falls.

F. L. Hinkly, M. D., Chicago Surgical and Electrical Company, 314 West Superior street, Chicago, Ill.

L. J. Bischel, Eagle Telephone Company, Dousman, Wis.

Ed. J. Luis, Eagle Telephone Company, Eagle, Wis.

P. C. Brown, Edgerton Telephone Company, Edgerton, Wis.

Joseph Edwards, Elroy Telephone Company, Elroy, Wis.

R. S. Cummings, Elk Mound Telephone Company, Elk Mound, Wis.

J. Skinderviken, S-R Electric Company, 160 North Fifth avenue, Chicago, Ill.

Geo. H. Dobbins, Fremont Telephone Company, Fremont, Wis.

E. B. Smart, secretary and manager, Wood County Telephone Company, Grand Rapids, Wis.

Otto Wippermann, Mosel and Centerville Telephone Company, Haven, R. 6, Wis.

E. P. Harley, Farmers and Mechanics Telephone Company, Lena, Wis.

W. T. Sparks, Lodi Telephone Exchange, Lodi, Wis.

Wm. Gostting, LaCrosse Telephone Company, LaCrosse, Wis.

A. C. Burke, LaCrosse Telephone Company, LaCrosse, Wis.

J. C. Nelson, LaCrosse Telephone Company, Viola, Wis.

W. F. Goodrich, LaCrosse Telephone Company, LaCrosse, Wis.

J. C. Crowley, Jr., secretary, Nebagamon Telephone Company, Lake Nebagamon, Wis.

Superintendent, La Crosse Telephone Company, La Crosse, Wis.

W. R. Schmidley, Wisconsin Railroad Commission, Madison, Wis.

W. R. Sherrick, United Telephone Company, Blanchardville, Wis.

M. F. Meyer, The United Telephone Company, Monroe, Wis.

R. M. Austin, The United Telephone Company, Monroe, Wis.

Dr. A. W. James, Hoover Hollow, Muscoda, Wis.

S. Sauk, Park Hotel, Madison.

H. A. Price, Markesan Telephone Company, Markesan, Wis.

S. E. Burke, United Telephone Company, Monroe, Wis.

P. E. Carroll, Mauston Electric Service Company, Mauston, Wis.

D. L. Bestor, Mazomanie Telephone Company, Mazomanie, Wis.

Wm. Kurth, president, The Lynn Telephone Company, Neillsville, R. R. No. 1.

W. L. Smith, Badger State Telephone and Telegraph Company, Neillsville, Wis.

L. N. Johnson, Ogema Telephone Company, Ogema, Wis.

D. L. Remington, Osseo Telephone Company, Osseo, Wis.

Chris Hett, president Ontario-Wilton Telephone Company, Ontario-Wilton, Wis.

W. E. Bristol, secretary Oakfield Telephone Company, Oakfield, Wis.

E. E. Hinksor, Poynette Telephone Company, Poynette, Wis.
F. H. Runkel, Portage Telephone Company, Portage, Wis.
J. E. Witwen, secretary Twin City Telephone Company, Prairie du Sac, Wis.
H. J. Reuschlein, Ploin Telephone Exchange, Ploin, Wis.
F. J. Roberts, Reedsburg Telephone Company, Reedsburg, Wis.
J. L. Fanneybein, Papete Telephone Company, Rio, Wis.
Walter J. Gallon, Citizens Telephone Exchange, Sheboygan, Wis.
E. B. Bowler, Citizens Telephone Exchange, Sheboygan, Wis.
Lyle T. Olcott, St. Croix Valley Telephone Company, St. Croix Falls, Wis.
C. B. Randall, Tri-State Telephone and Telegraph Company, St. Paul, Minn.
G. P. Poole, superintendent Monroe County Telephone Company, Sparta, Wis.
A. D. Hawthorne, Tri-State Telegraph and Telephone Company, St. Paul, Minn.
C. W. Block, Utilities Indemnity Exchange, St. Louis, Wis.
E. B. Fisher, U. S. I. Telephone Association.
P. D. Miller, Dell Co-operative Telephone Company, Dell, Westby, Wis.
H. O. Stevlingson, Westby Telephone Company, Westby, Wis.
Geo. S. Byer, Westby Telephone Company, Westby, Wis.
J. F. Prentiss, Watertown Telephone Company, Watertown, Wis.

The exhibitors and their representatives were: Stromberg-Carlson Telephone Manufacturing Company, L. E. La Fleur, F. K. Cannon; Cracraft, Leich Electric Co., T. J. Gullion, A. J. Kohn; Western Electric Company, A. R. Maynard, D. H. Frick, G. E. Brown, A. M. Collins, J. F. Sweeney; Automatic Electric Company; S. R. Electric Company, J. Skinderviken; Garford Manufacturing Company, George H. Crandall, E. L. Klingel; Orangeburg Fibre Conduit Company, F. C. Smith; Illinois Electric Company, Frank P. Kennedy, A. H. Keith; Julius Andrae and Sons Company, W. H. Croswell, H. S. Greene; Kellogg Switchboard and Supply Company, C. C. Hoffman, H. W. Bryce, A. J. Carter, F. L. Eldridge; Monarch Telephone Manufacturing Company; Utility Indemnity Exchange, C. W. Block; Reliable Electric Company, G. W. Rodormer; Frank B. Cook Company; W. N. Matthews & Brother; Cox Lightning Arrestor Company, W. F. Cox.

Sixth District of Missouri Meets

The Sixth District of the Missouri Independent Telephone Association held its convention in the parlors of the Hotel Terry, in Sedalia, Missouri, on January 26 and 27, with the largest number attending that had ever been registered at a district meeting in Missouri.

It was the intention to hold an operators' meeting on the 26th only. However, the large number in attendance, over sixty being present, decided to continue the meeting on the 27th. The convention was called to order by President W. R. Journey of Higginsville and Secretary S. R. Smith filled his office. After the address by the president, W. W. Johnson, secretary of the Missouri Telephone Association, delivered a talk on courtesy and promptness on the part of all employes, after which a motion was made and carried to the effect that the association recommends that the specifications for overhead railway crossings now being considered by the wire using companies, railway companies and the Public Service Commission, specify the use of brackets on crossing spans where not to exceed two wires constitute the spans, that the wires be dead ended on brackets, that double brackets be used and that guard wires be included.

The members attended the noonday luncheon given by the Sedalia Chamber of Commerce, at which S. R. Smith acted as toastmaster. Addresses were made by City Counselor Roberts and by members in attendance.

At the afternoon session M. L. Golloday of Holden gave an interesting talk on the collecting of farmer line switching fees, etc., and a general discussion ensued in which many participated.

On Thursday, January 27, the convention began its second day session. The Public Service Commission and its relation to the telephone companies was handled by W. W. Johnson, after which a paper by Meddie Hanks of Higginsville on simple and necessary records for a local exchange was read. This paper was very interesting and instructive, and appears in this issue. J. M. McShane, chief accountant for the Public Service Commission, explained methods of bookkeeping and making of reports for Class D companies.

At the afternoon session C. A. Bennett, general auditor of the Gary properties of Kansas City, Missouri, talked on Class C and Class D companies' accounting systems. The nominating committee, consisting of M. L. Golloday, S. T. Neil and F. Holmes, presented their report, nominating the following:

President, Bert Wright, Cole Camp.
Vice-president, H. C. Houstin, Pleasant Hill.
Secretary, S. R. Smith, Sedalia.
Treasurer, H. Harrison Simpson, Pilot Grove.
Executive Committee, L. S. Arnie, Otterville; Willis Smith, Sweet Springs; J. Creig, Knobnoster.

These were duly elected to serve during the year 1916.

The operators' meeting was in charge of A. J. Shands, superintendent of the Kinloch Telephone Company, and H. E. Gwilliam, traffic superintendent of the Kansas City Home Telephone Company. F. E. Penfield, traffic superintendent for the Missouri and Kansas Telephone Company, Kansas City, was present also.

A paper on the subject of operating was read by Mrs. Lulu Anderson, of Higginsville, Missouri. It was decided to hold these operators' meeting throughout the entire state and at such intervals as was thought necessary. Over 130 registered attendance at the convention.

Early Morning Call

In Futurist Verse.

Mankum—sleepum
Slumbum dum;
Dreamaway—breakoday;
Pray—no—come.

Bizzaling—lingating
Zizz zizz zing;
Popoflo—hopoflo
Feet—cold—fling.

Hearbell—grabtell
Hello yell;
Clickylick—lickytick;
Zhow—zhum—z'hell.

Maidpetite—operasweet
Lambkins bleat;
Numbersneeze—Excusepleaze
Gozleep—cold—feet.—Judge.

Telephone Talks

The March, 1916, Installment of an Instructive Serial Course for all Telephone Workers

BY G. W. CUMMINGS AND ARTHUR KNEISEL*

WHEN the Technical Club reached the discussion period of its program the members found no questions carried over. Therefore the President called for a question to suggest a talk for the evening. The Installer's Helper arose and upon being recognized by the chair asked "How do we furnish the 'juice' we use in runnin' the Exchange?"

"I presume you mean to inquire how we charge our batteries," replied the President. "For we have discussed the manner in which we feed battery to the talking and signaling circuits in an exchange. Your question might be answered by the Jumper Man, who looks after the power equipment, or by the Switchboard Man, who, realizing the importance of keeping this apparatus in the best shape possible, keeps a close check on it; but I think we will call on the Wire Chief for a talk. The Switchboard Man has been kept rather busy answering questions in the last three or four meetings.

"Alright," responded the Wire Chief. "If the Clerk will look in the lower left drawer of my desk and get me the photographs I will show you a power room layout which is considered up to the minute and I will begin by telling you something about the storage batteries we use.

"When we place two dissimilar metals into a solution containing acid and connect the two by a wire we get an electro-chemical action and we have the simplest form of a primary battery. It is so called because it will supply an electric current without having previously been charged by electrical means. During the electro-chemical action one of the metals will be consumed by the acid while on the other will form a layer of gas bubbles which tend to insulate that metal. This is called polarization of the cell. To prevent polarization in a primary battery some means must be supplied to rid the positive plate of this gas. This is usually a chemical means. Among primary batteries we have the salammoniac battery, the bichromate of potash, and the dry cells. These are very efficient in circuits which are used intermittently and are consequently called open circuit batteries.

"Then there is the two-fluid cell in which each pole of the battery is immersed in some solution containing a salt of the metal itself. This kind is sometimes called the closed circuit or primary-storage cell. In one type of this kind, known as the gravity cell, the two solutions are separated only by the difference in their specific gravities. The zinc plate is suspended from the top of the cell jar and is surrounded by a solution of zinc sulphate, which, being the lighter, floats in a solution of copper sulphate in which a copper plate is immersed. While this cell is discharging, zinc is passing into the zinc sulphate solution and copper is deposited onto the copper plate from the copper sulphate solution. It is very effective for closed circuit work but must be replenished often and this is a disagreeable, dirty work. Then, too, the voltage of this type of cell is low, so it would require many more cells and consequently more space than our present storage battery. The gravity battery may be classed in some respects with storage cells because by connecting its terminals to a direct current source of supply its action is reversed, although this is not economical.

"Since the primary cell is open to the objection of polarization, insufficient capacity and need for frequent replenishing, and the primary-storage cell is open to the same objections except polarization we have adopted the lead-lead storage cell.

"In this the two plates or rather sets of plates are lead grids, the positive of these being filled in with peroxide of lead and the negative being filled with lead in a spongy state. The two sets of plates are arranged to alternate, being set in a glass, porcelain or lead-lined tank which is then filled with sulphuric acid diluted until it has a specific gravity of about 1.2. It is made by gradually pouring one volume of acid into five volumes of water. Sulphuric acid has a great affinity for water and if the water were poured into the acid great heat would be generated. Sulphuric acid burns are dangerous, particularly in that they do not heal readily, and great care must be exercised in pouring it into the cells. All the positive plates of a cell are 'leaded' together and connected to the negative plates of the next cell which are also connected together. In other words, a lead bar between each two cells has the positive plates of one cell and the negative plates of the next leaded to it."

"Why do you have more than one of each plate in every cell?" asked the Installer's Helper.

"That is to increase the capacity of the cell," responded the Wire Chief. "Each cell will show a potential difference of about 2.5 volts between its positive and negative plates after being charged and as the cells are connected in series, the voltage of the battery will be equal to 2.5 times the number of cells. The amount of current which can be stored in them will depend upon the area of the plates and it is by increasing the number of plates that we greatly increase the amount of plate surface.

"The voltage of each cell is not dependent upon the number of plates in each cell nor upon the size of the plates. As the plates are very close to each other, they are protected against touching each other by glass, wood or hard rubber separators. Often the battery installed in an exchange is not equipped with a full complement of plates and these are added as the exchange outgrows the former capacity of the batteries. It is of some advantage to have but few more plates than are actually required to carry the maximum load.

"When a battery of storage cells has been set up and filled with the diluted acid, or 'electrolyte,' as it is called, the positive pole of the battery is connected to the positive pole of some source of direct current energy. This may be a direct current generator or a mercury arc rectifier."

"How do you know which is the positive plate of the battery and which is the positive pole of the generator?" asked the Cablesplicer's Helper.

"The positive plates of the battery are a chocolate brown color, while the negative plates are light gray. If the positive wire of the charging circuit is not known, this may be determined by cutting a lamp or other resist-

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ance in series with one wire and touching both the positive and negative wires into a glass of salt water. Gas bubbles will form on the negative wire.

"The battery is then charged according to its size, and the specific gravity of the electrolyte is raised. The voltage of a newly charged cell may rise as high as 2.7

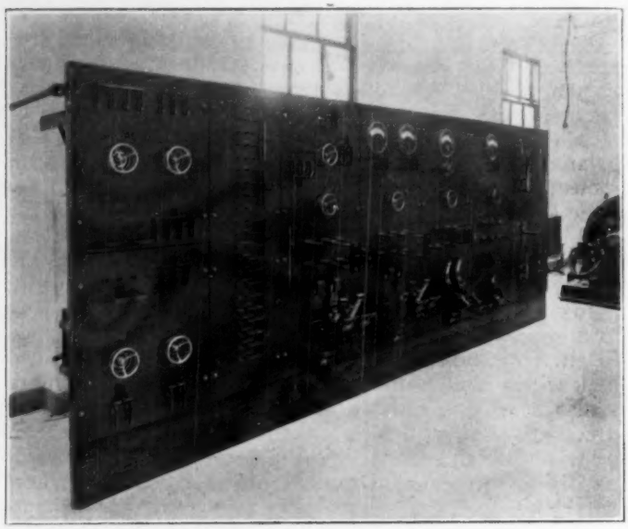

Fig. 93.

volts. The plates give off gas freely at this time. During the discharge of the cells the acid of the electrolyte combines with the spongy lead and the peroxide of lead to form a soluble sulphate of lead. During this action the specific gravity and voltage both fall. This process is reversed during the charging period.

"The gases given off during the charging of storage batteries are very active and it is necessary that all iron work, woodwork or wiring near them be painted with some insulating paint. This reduces the danger of foreign particles falling into the cells. Any metal falling into a cell would ruin it in a short time. The cells can be covered with glass plates to retard evaporation but then they are less convenient of access. They must be watched carefully so no short circuits will form between the plates and so any sediment in the bottom of the tanks will not reach as high as the bottom of the plates and short circuit them. Likewise it is necessary that the solution be kept well above the top level of the plates. Eternal vigilance is the price of success in the use of storage batteries.

"When storage batteries were first used in telephone work it was customary to furnish two sets of batteries, one being charged while the other discharged; but this was found an unnecessary expense, and now charging apparatus is arranged to carry the load and charge the batteries at the same time. Naturally there is not so much current available for charging the battery during the peak of the load as there is during the period of no traffic load, and we usually arrange our charging period so that the cells will have been brought to their highest charge during the light traffic. Then the charging machine is regulated to 'float' the office load, that is to furnish just about the current required.

"Too much importance can not be placed upon the care to be taken of the storage batteries and charging apparatus, for a breakdown in them is most serious. To minimize the danger of a breakdown we supply emergency apparatus. In many of our offices the regular charging equipment consists of an alternating current motor directly coupled with the charging generator. The method of putting the batteries on charge is as follows:

"First—Start the motor. If this is an a. c. machine the 3-blade knife switch is first closed and the compensator switch is thrown to the side marked 'start' until the machine comes up to speed and is then quickly thrown to the running position. If the machine is a d. c. motor, the line switch is closed and the starting box wheel is turned slowly until it locks. Throwing it over too rapidly will blow the fuses of the motor.

"Second—Throw in the circuit breaker.

"Third—Read the voltage of the office battery and set the pointer of the voltmeter to that reading.

"Fourth—Connect the voltmeter to the generator circuit and cut out the field resistance until the generator voltage is about one-half a volt higher than that of the battery.

"Fifth—Throw the charging switch clear in and cut out the field resistance gradually until the output of the generator as read on the ammeter is equal to the discharge plus the normal charging rate as given in the instructions for that office.

"This routine is simple but must be followed closely, for if the charging switch be closed when the circuit is closed a fuse is sure to go.

"I recall a case which occurred about sixteen years ago, shortly after I started into the power room work. I closed the wrong charging switch and let the battery flow back into an idle generator. Luckily, the main fuse blew before the generator burned out. I quickly pulled out that switch when the flash occurred and promptly forgot just exactly what I had done. The Superintendent of Maintenance was in the power room and took in the situation at a glance. Without hesitation he caught the two parts that remained of

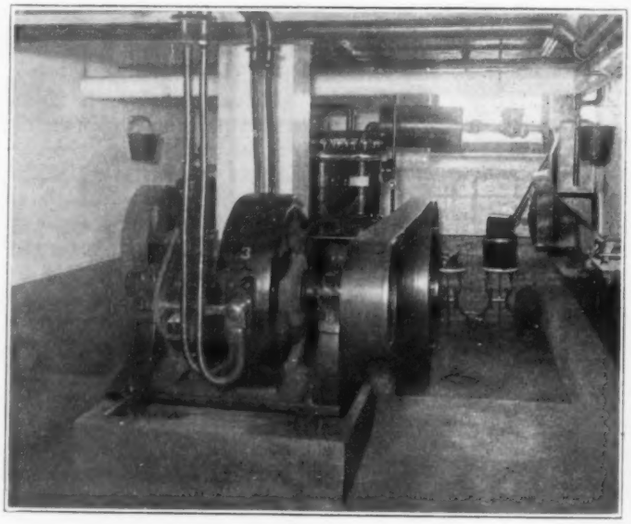

Fig. 94.

the flat link fuse and held them together with his fingers until I handed him a machinist's wrench, with which he bridged out the fuse posts until we could put in an new fuse. If he ever sees the record of this meeting, he may understand what really happened to the main discharge fuse that day during the five o'clock peak load. I have always admired the rapidity with which he took in the situation and applied first aid at such a critical time.

"We have record of a case where the circuit

breaker was thrown in with the charging switch closed before the generator voltage was high enough. Something had to 'let go,' and the main discharge fuse blew. This opened the office battery and it was found impossible to get a normal output from the machine. When the machine was shut down, battery was found on the switchboard, but this came in from the various branch exchanges.

"To prevent arcing at the switch blades or other trouble when shutting down the generator, the output is cut down by cutting resistance in the field circuit until but few amperes are flowing and then opening the charging switch, circuit breaker and motor switch in turn. In case of an a. c. machine, it is necessary to throw the starting lever to the middle position, but in a d. c. machine the starting box is made so it will release itself."

"What is a circuit breaker, and what does it do?" asked the Installer's Helper.

"If you will look at this photograph of one of our latest type power boards (Fig. 93) you will note three rather complicated looking pieces of apparatus in the lower middle part of the board. These are circuit breakers.

"They are cut into a circuit to open it automatically if the current flowing through it should drop below a predetermined amperage, and likewise to open if the current rises above a predetermined point. Its blades are carbon blocks, which are not damaged very much by an arc. And besides, they are arranged with powerful springs, which cause a quick break in case they are tripped.

"In case a circuit breaker trips for any reason it is wise to cut resistance in the generator fields and open the charging switch before closing the circuit breaker.

"To avoid the possibility of a complete shut down

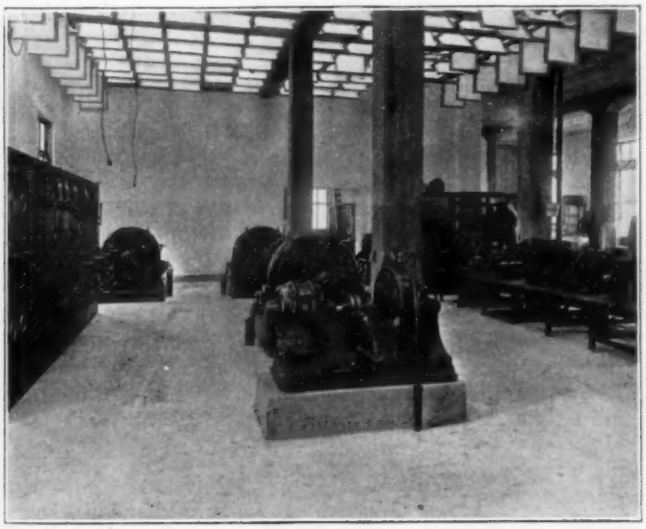

Fig. 95.

in an exchange, we supply emergency apparatus, and in order that this may be kept in proper working order, we set aside one day per week on which we operate all our exchanges entirely with the emergency apparatus for several hours.

"The Edison current may fail, and to provide against this contingency we have the gas engine with its belt-driven charging generator, such as is shown in this photograph (Fig. 94). This also shows the gas meters, muffler and the ever-present sand pails for first aid in case of fire.

"In using the belted generator the same procedure outlined for the regular machines is followed after the engine has been brought to full speed.

"In addition to the main battery charging apparatus we also have two ringing machines, each supply-

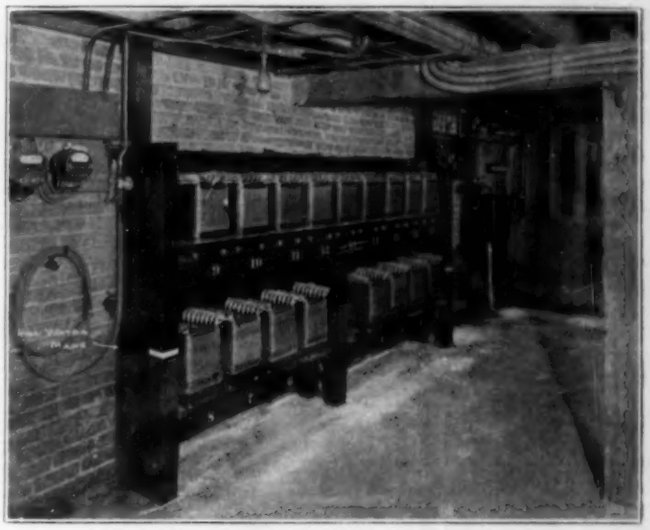

Fig. 96.

ing alternating, and positive and negative pulsating current. One of these is direct-coupled to an a. c. motor operated by Edison current and the other is direct-coupled to a d. c. motor operated by the exchange battery. These same ringing machines also supply tone test, busy back, ticker tone, and ringing interruptions.

"When calls for a line are to be questioned, a high-pitched tone test is put on its sleeve, so that when the operator tests for busy she will get this tone but no battery click, and will refer the call to the information operator, instead of completing it. A similar plan is used to notify an operator if a line is out of order. A 'trouble tone' is put on the sleeves of the hospital cords, so that this tone is put on every sleeve of a line as soon as a line is plugged up in the hospital. This trouble tone is the same as tone test, but is superimposed on battery so that the operator gets a click upon testing a line in trouble. Tone test is secured by sending current from the office battery through the winding of a 5410 transformer having windings of 1030 ohms to 1/3 ohms and passing this through an interrupter wheel on the shaft of the ringing generator to ground. The interrupter opens the circuit from 400 to 800 times per second, resulting in an alternating current of this frequency, which is repeated in the 1/3 ohm winding of the transformer.

"The 'busy back' is supplied to enable the B-operator to notify a calling subscriber when a called line is busy, for she has no way of verbally communicating with him. After many expedients had been tried to find a satisfactory method of busy information, the present simple and reliable method of interrupted busy back was devised. It is set up in somewhat the same manner as the tone test, except that the busy back wheel gives a lower frequency—150 to 200 per second. In order that the buzz may be interrupted, a portion of the interrupter wheel is

solid. One side of a 2 mf. condenser is wired through a 400 ohm resistance coil to the ring of the busy-back jacks on the B-board; the other is alternately charged through an adjustable resistance of from 2000 to 4000 ohms and discharged by the busy-back wheel. It is necessary that the trunk should be tripped, and desirable that the F-operator be flashed, so she can inform the calling subscriber in case he fails to understand the busy back. These objects are accomplished by taking a tap from the jack side of the condenser through two 8 K coils in multiple and through a flashing wheel to ground. The sleeve of the jack is grounded to operate the sleeve relays of the trunk.

"On nickel first party lines it is necessary to inform a subscriber that his line is not in use before he deposits his nickel. This is done by keeping 'ticker battery' on the line until the operator answers a call and substitutes her cord battery for the line battery. It is sometimes secured by interrupting the office battery through a transformer to ground, but sometimes a higher voltage battery is used.

"We interrupt our ringing current to make it more effective and less a nuisance than if constant. The interruptions are secured by passing the ringing current directly through interrupter wheels controlled by the ringing relays or by relays which are operated by the interrupter wheels. During the non-ringing period we substitute 110-volt current to enable the called subscriber to trip the trunk between ringing periods.

"This photograph (Fig. 95) shows the layout of the power plant of our latest office and is more roomy and lighter than any of the older ones. When this is entirely completed it will be a model of spick and span cleanliness and convenience.

"In addition to the machines mentioned, we also have motor-generators which supply 110-volt positive and 110-volt negative current for coin prepayment work and machines for charging the batteries used in operating the service meters and also the batteries which supply booster current for long subscribers' lines. In some exchanges we maintain two batteries of dry cells for emergency purposes on the coin prepayment work.

"You will note that every precaution possible is taken to give service constantly. We are here to *serve* the subscribers and must be prepared to serve them irrespective of weather, fire, storm or flood, for it is during such time that the telephone must help more than at any other time. With all our precautions, we sometimes have narrow escapes, as is shown by this photograph (Fig. 96). Ice-choked sewers prevented the drainage of a heavy spring rain, so that flooded basements were the rule. In this office we managed to keep the water about one inch below the tops of the battery jars by calling upon a fire engine to help pump water out of the basement as quickly as it came in."

"If we don't cut short this talk we'll never get to bed tonight and we won't be able to serve tomorrow," said the Repairman, "so I move we adjourn."

The motion was put and carried.

(To be continued.)

A dividend of 30 per cent on the stock which is selling for $170 a share was declared by the Green River Telephone Company, which is owned by farmers at Sterling, Illinois.

Pay Millions to Protect Light

The American Telephone and Telegraph Company is about to pay between $2,000,000 and $2,500,000 to protect the light and air of its new twenty-eight story office building at the northwest corner of Broadway and Dey street, New York. In other words, the company has agreed to purchase at the price stated the property of the estate of the late Elliott F. Shepard at 201 and 203 Broadway, including the Mail and Express building, a ten-story structure, part of which is the home of the *Evening Mail*. The properties, that at 201 Broadway, being a low structure, adjoin the new Western Union building on Broadway and in the rear give the company ownership of 164 to 168 Fulton street, adjoining a 33 foot frontage it already owns, which has been covered by a section of the new office giant.

The purchase insures forever the permanent light and air of the Western Union building, for with streets on two sides the only property on the other two sides it does not own is the eleven story New York Law School building on Fulton street, a permanent structure. Two low buildings in the rear on Dey street adjoining the telephone building were purchased last month by the company in its efforts to protect the big granite pile.

F. H. Bethell, representing the American Telephone and Telegraph Company, announced that his company had secured an option to buy the property. It is not the intention of the buyers at this time to make any changes or alterations in the buildings.

Wins Rate Case from City

The Citizens' Telephone Company is victor over the city of Cadillac, Michigan, in a two-year fight over telephone rates.

Judge Fred S. Lamb dismissed the city's suit against the telephone company February 1, declaring that the "city had not established any cause for complaint, either in law or in fact." As a result the company can raise rates for private telephones from $15 to $18. The company in 1913 raised its rates to $18. The city secured a temporary injunction restraining the company from boosting the rate, declaring that it had an agreement with Henry Sill, who established the telephone system in the city, to the effect that the rate should never be higher than $15. The company said it knew nothing of the agreement and was bound to comply only with regulations of the state railway commission.

Judge Lamb ruled that the records failed to show Sill had ever made such a written agreement with the city. In 1900 the city passed an ordinance making $15 the maximum rate for private telephones. Judge Lamb held that the ordinance "lacks all essentials of a contract and is inoperative against the Citizens' Company."

City of Keokuk Loses

The ordinance passed by the city of Keokuk, Iowa, August 12, 1913, providing for the regulation of telephone rates and prohibiting the operation of the telephone plant without first obtaining a franchise, has been declared in no way binding on the company, and the city of Keokuk has been permanently enjoined from enforcing it by a decree handed down by Judge Martin J. Wade in the federal court. The special master in chancery, Judge Robert Sloan, who heard the case in 1913, and who made the preliminary hearings, was allowed $750 for his fee. The costs of the suit have been taxed against the city of Keokuk.

Simple Records for Local Exchanges

Paper Read Before the Sixth District Missouri Independent Association

BY MEDDIE HANKS

NO ONE should undertake to offer suggestions and instructions on a subject in which he was not in every way proficient. However, it has been suggested to me that I, with my limited understanding of the matter, might know of difficulties encountered by a beginner, which an expert accountant might not be able to appreciate. So it is with that intention and not because of anything I think I may add to the many excellent articles which have been prepared on the subject, that I shall attempt to outline a few simple and necessary records for a small exchange.

To begin: A company's accounts are divided under two heads, Resources and Liabilities. The Resources of a concern include everything of actual cash value which belongs to the company, such as cash, lands, buildings, plant and equipment, notes and accounts which are due the company. If the present records of the company do not show the actual value of the plant and equipment in service, it must be gained by taking an inventory.

The Liabilities of the company include anything in the nature of a debt which must be paid at some future time, whether in the form of bonds, notes, mortgages, or accounts payable. Also include in the Liabilities the amount of paid up Capital Stock if an incorporated company, or if an individually owned concern, ascertain the owner's original investment as nearly as possible.

With such figures as a basis, one is ready to begin. These items are recorded in the book known as the Journal. It is in this book that the "double entry" occurs. By double entry is meant that for each amount placed on the debit side of the Journal, a corresponding item of the same amount is placed on the credit side. These items being posted to a general ledger, will make the sum of all the debits on the ledger, equal the sum of all the credits. The figures which go to make up the Resources are all placed on the debit side, and the Liabilities on the credit. To make the double entry, when an item is charged, or debited, some account must be credited. In opening, all these amounts may be credited to an account called Surplus. The surplus represents the accumulated earnings of the company from the first day of operation. Just as all the amounts which are placed on the debit side are *credited* to Surplus, so all amounts which are credited to Liabilities, are *debited* to Surplus. Now to take up the subject of Depreciation. A certain amount of the earnings should be set aside periodically, to cover the estimated decrease in value of the plant owing to wear and tear of equipment. This is usually estimated at a certain per cent of the value of the plant. For instance if a plant valued at $30,000 is estimated that it will depreciate $1,500 a year, an amount shall be set aside monthly, which will cover this $1,500 in a year. Of course this does not mean the actual sum of money is put aside, but that amount is charged against the earnings for that month, and credited to an account called "Reserve for Depreciation." To take care of the Depreciation that may have taken place prior to the opening of the books will necessitate an analysis of the plant value at the time of opening books, and at the time of construction. Arriving at a figure which will cover the probable depreciation since starting, this amount is made a charge to Surplus account and a credit to Reserve for Depreciation. At any time during the course of the business certain replacements are made which are judged to be chargeable to Depreciation, the cost of such replacements is charged to this Reserve for Depreciation. When the Journal entries are made thus far, the other books are to be taken up.

Companies differ as to the handling of the Cash books. Some companies combine the Cash book with the Journal, and make charges and credits to cash, only in lump sums, then carry another book called the Voucher Record to show distribution of cash disbursements. In the set of books explained here, no Voucher book is carried, letting the credit side of the cash book show distribution of expense. The amount of cash on hand at time of opening books is made a charge to Cash and a credit to Surplus. This amount on hands is entered on the right hand or debit side of Cash book. All cash taken in subsequently is entered here, showing from what source it was received, whether from Rental, Tolls or miscellaneous sources. It is advisable to keep a Daily Cash book to record all payments made by subscribers, and on the Cash book proper, make entries only when bank deposits are made. These bank deposits of course are the footings of the Daily Cash book. On the credit side of Cash book are shown all disbursements. This page is ruled into several columns, a column for the different classes of expense, and a column for Ledger accounts, or those which have been charged on the Ledger by a Journal entry. When a check is issued, the date, check number, name of the party to whom issued, and the amount, are all entered in the spaces provided and each amount is then carried over to the column to which it is to be charged, or if paying off a Ledger account, place under that column. Most companies make all disbursements by check, but if it is preferred to make small payments in cash, a check is drawn at the first of the month which will be sufficient to cover these minor expenses, and a side account kept as to the distribution of this amount. Each item will of course be charged to its proper expense account, and at the end of the month, or beginning of the next, another check made, to cover the amount spent. Such distribution of this petty cash account will show on the Cash book, or if Cash book is closed before the second check is written, it is carried through the Journal. To take care of other expenses which will occur after Cash has been closed for the month, but which belong to that month, will require a Journal entry, charging the proper account, and crediting the party or firm to whom payment will be made. This will necessitate a few more Journal entries than would occur where the Voucher system is used, but it has been our experience that practically few accounts come up which are not paid during the month.

Besides the Resources and Liability accounts, all accounts are either Revenue or Expense accounts. Each source of revenue is given an account number, as is each class of expense. These numbers are made uniform, as prescribed by the Interstate Commerce Commission under Resources, those accounts which add to the value of the plant and equipment are called Fixed Capital accounts. The different classes of Fixed Capital are also num-

bered, example: Account number 220 includes all central office equipment, number 230 station equipment, etc., while under expense we have number 600, repairs to wire plant, 610 repairs to equipment. The revenue accounts are numbered: 500 is exchange, or rental revenue, 510 toll revenue. (The above numbers apply to companies known as Class C companies.)

Under our old system of keeping accounts, we showed by our cash book a record of all money taken in during the month and the money paid out. The former was totaled and counted as our revenue for that month, just as we considered the amount spent to be our expense for that month. A glance would show how misleading a statement of this kind might be. Suppose January collections to be very poor, while in February we collected a large amount on back accounts. This would show January revenue much lower than February while in reality the revenue should have been reckoned on the amount charged rather than the amount collected. So with disbursements. If an account which was due in January was not paid until February, and then both months paid at once it would cause February expense to appear larger. To take care of this we have what we call our reserve accounts. In the case of taxes, for instance: The year's taxes are usually not paid until December. This would make December expense seem unusually large, yet this is corrected by making each month a charge to expense, and a credit to "Reserve for Taxes." The amount reserved each month can be estimated from a year's taxes for previous years. Each month will, of course, carry one-twelfth of the amount as its portion of the year's tax expense. At the end of the year, when the taxes are paid, the check is carried through the Cash book, and is posted as a debit to the account "Reserve for Taxes," thus clearing the account.

A telephone company's revenue is principally for exchange and toll service. A ledger, called Subscriber's Rental and Toll Ledger, carries the name of each subscriber, and each month the proper charges are made for rental and for tolls. A total of the charges for each month will give the revenue for that month. To transfer these amounts to the other books, an entry is made in the Journal making a charge to "Rental & Toll Accounts Receivable" and crediting Operating Revenue, numbers 500 and 510. As the subscriber's accounts are paid, they are credited to this Subscribers' ledger, from the daily cash book. The amount paid by subscribers for rent and toll will agree with the amount shown on the Cash book as deposited for rent and toll. From the Cash book, the total collected for this account is then posted to the general ledger account as a credit to "Toll and Rental Accounts Receivable."

The expense charges for the month are ascertained, first from the reserve accounts and other Journal entries, and then from the footings of the various expense columns in the Cash book. When Cash is footed at the end of the month, a footing is also made of each of the separate expense columns, thus showing the amount spent for each different class of expense. The means of getting an accurate distribution of the labor expense is found in the foreman's daily work reports. Each day's work is so reported as to show how many hours were spent on each class of labor. The appropriate charges per hour are made later, and these amounts are totaled for the month. This gives a showing of how much of the wages paid went toward repairs to lines and wires, repairs to telephone equipment, and how much toward additions to the plant. The operator's salaries, general office salaries and other salaries are then included, making a total of the pay roll check for the month, or period of time which the check covers. If this check is paid during the current month, the distribution will show on the Cash book. If not paid until after Cash is closed, one Journal entry will charge the various accounts, and make the total amount a credit to "Pay Roll Account." Then when Pay Roll is paid, cash will credit this account, thus closing it.

In the matter of handling the material and supplies account, when original inventory is made, the amount of material on hand is reckoned as a Resource, hence charged to an account called "Warehouse" account, and credited to Surplus. When new material is purchased it is charged direct to this Warehouse account. As this material is used, the foreman by his work reports, shows the exact disposition of such material, and the value, used on the different lines of work—whether for repairs to wire plant, equipment, or Fixed Capital. The total of these amounts is made a credit to Warehouse account, and a charge to the various accounts for which they were used. Should telephones or equipment be taken down and returned to stock, they are made a charge to Warehouse account, and a credit to the Fixed Capital account from which it was taken. In the matter of new supplies purchased which are known to be for a certain express use, such as poles which are to be put at once into new pole line, or wire for the same purpose, they may be charged at once to their proper account without being taken through Warehouse.

The Journal and Cash book are now ready to be posted to the General Ledger. This Ledger contains a summary of the entries of both the other books. A separate page is opened for each account, and in case of the Revenue and Expense account, it is well, in posting items, to post the account number with the item, which will aid in making up a condensed statement of earnings and expenses. In posting from the Cash book to Ledger all items on the debit side of Cash are posted to the credit side of the Ledger, and credit side of Cash are posted to the debit side of the Ledger. As each different column of expense in Cash was totaled, the one amount for each may be posted to Ledger. Each item under the column headed "Ledger Accounts" on Cash, are of course posted to the separate Ledger accounts. In posting from the Journal, post debits to the debit side of Ledger and credits to credits.

When all items from each book have been posted, the Ledger accounts are then footed and the balances written lightly in pencil on the side on which balance occurs. Then the Ledger is ready for a Trial Balance to be taken. This Trial Balance is merely a summary of all the Ledger balances. When the sum of the debit balances equals the sum of the credit balances, the Trial Balance is correct. If the accounts on the Trial Balance are listed, a financial statement may then be made from it, listing all the Resources, and the Liabilities. The Revenue and Expense accounts will show the Gross Revenue and Expense for the period shown, and the difference between them will show the Net Gain or Loss, as the case may be. This Net Gain, on the Financial Statement, is added to the Surplus, and goes to make the total of the Liabilities equal the total of the Resources. But it is added to surplus on the Financial Statement only, as the Expense and Revenue accounts are not balanced until the end of the year, or when books are closed. They are then transferred to the Surplus by a Journal entry.

The True Nature of Speech

Paper Read Before the American Institute of Electrical Engineers

BY JOHN B. FLOWERS

SPEECH is a rapid variation in amplitude of one or more tones, there being a definite form of variation making a pattern for each letter sound of the alphabet. These patterns are not formed by the superposing of tones of different pitch to give a certain quality to the tone but by a definite form of variation in the amplitude of a single tone or tones. This previously unknown form of variation of amplitude, quite different from the ordinary change from soft to loud, should be called the speech-variation. What is meant is that if a tone of a pitch of say 1000 cycles per second commences in such a manner that the first 10 to 20 cycles vary in intensity after the definite patern ⌒, the sound *b* will be produced and heard (Fig. 1). But no matter what the pitch of the tone, if its intensity is made to vary according to this definite pattern in a *small fraction of a second*, the sound *b* will be produced (Fig. 2).

The interest of the telephone man in this article must necessarily be purely scientific, since it suggests no commercial or practical development, at least immediately. It cannot fail, however, to lead the scientifically minded man (as most telephone men are) into a most absorbing field of speculation.

A voice-operated phonographic writing machine, such as the paper forecasts, will inevitably be developed and must become of importance as a telephonic adjunct. It is not unreasonable to suppose that telephone messages will be recorded by such a device before many years. In the meantime, the analysis of speech should interest all telephone men.

That speech is a rapid variation in intensity of the voice and mouth-tones according to definite sound patterns called letters of the alphabet, is proved, by showing that speech is the result of action of the mouth-parts in varying the intensity of the voice and mouth-tones, and through photographs taken with the string-galvanometer of each letter sound of the alphabet, showing definitely the characteristic variation in intensity of tone for each letter sound of the alphabet, showing definitely the characteristic variation in intensity of tone for each letter of the alphabet. From the curves, the phonographic alphabet is obtained by measuring the variations in intensity of the main tone of the record.

A design for a voice-operated phonographic alphabet writing machine is described. The object of this device is to record speech automatically in ink on paper in the form of an easily read compact system of natural characters called the phonographic alphabet. Its design comprises a high-power telephone transmitter controlling electric resonator circuits, the intensity of currents in which is measured by the vibration of mirrors reflecting light upon a selenium cell connected to a special recording pen.

When we speak the letter *b*, the fundamental tone and the overtones of the vocal chords together with the mouth-tones are all varied at the same instant of time according to the definite pattern ⌒. The same is true for each letter sound of the alphabet, as will appear in the table of patterns of the letters of the alphabet called the phonographic alphabet on another page:

In other words, if an open reed-organ pipe of, say, middle C pitch were blown and at its large open end were placed a mechanical device like the human mouth for opening, varying the opening, and closing the opening, and trilling and varying the air pressure, the organ pipe would speak like a human being, with wonderful power and majesty.

We quote Helmholtz: "Sensations of Tone," pages 66-67-68. "There has been a general inclination to credit quality with all possible peculiarities of musical tones that were not evidently due to force and pitch. But very slight consideration will suffice to show that many of these peculiarities of musical tones depend upon the way in which they begin and end. The methods of attacking and releasing tones are sometimes so characteristic that for the human voice they have been noted by a series of different letters. To these belong the explosive consonants *B*, *D*, *G*, and *P*, *T*, *K*. The effects of these letters are produced by opening the closed, or closing the open passage through the mouth. For *B* and *P* the closure is made by the lips, for *D* and *T* by the tongue and upper teeth, and *G* and *K* by the back of the tongue and soft palate. In wind instruments where the tones are maintained by a stream of air, we generally hear more or less whizzing and hissing of the air which breaks against the sharp edges of the mouthpiece. It is well known that most consonants in human speech are characterized by the maintenance of similar noises, as *F*, *V*; *S*, *Z*; *Th* in thin and in then; the Scotch and German guttural *CH*, and Dutch *G*. For some the tone is made still more irregular by trilling parts of the mouth, as for *R* and *L*. In the case of *R* the stream of air is periodically entirely interrupted by trilling the uvula, or the tip of the tongue; and we thus obtain an intermitting sound to which these interruptions give a peculiar jarring character. In the case of *L* the soft side edges of the tongue are moved by the stream of air, and, without completely interrupting the tone, produce inequalities in its strength. The formation of *M* and *N* in so far resembles that of vowels, that no noise of wind is generated in any part of the cavity of the mouth, which is perfectly closed, and the sound of the voice escapes through the nose."

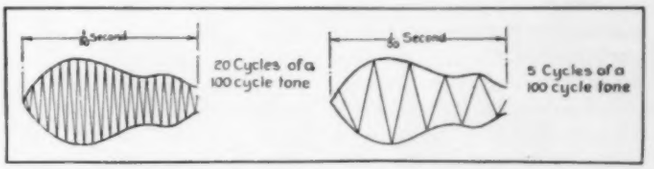

Fig. 1 *Fig. 2.*

DEFINITION OF VOWELS AND CONSONANTS

A vowel is a definite sound pattern which repeats itself at intervals, while a consonant is a definite sound pattern occurring but once. The consonant sound pattern must exist at least for 0.01 second, in order to be perceived by the brain, 0.01 second being the minimum perception time for speech sounds. The vowel sound patterns proper are about 0.01 second in duration, but as they repeat themselves again and again, may be of any duration the speaker desires. Under this definition, the consonants are b, c = k, d, g, j, k, p, t, and the vowels are, a, c = e, f, h, i, l, m, n, o, r, s, u, v, w = uo, y. z.

Written language is made up of consecutive pat-

tern pictures, one pattern or form standing for each letter of the alphabet, and the eye is able to distinguish between them if they approximate the standard form. Likewise, spoken language is made up of consecutive pattern pictures, one pattern or form standing for each letter of the alphabet, and the ear is able to distinguish between them when they approximate a standard form.

In reading a submarine cable message on the tape, the eye must pick out the pattern forms of each letter (Fig. 3). That the eye can read these messages as fast

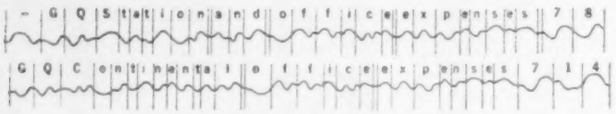

Fig. 3. Cable Message Received by the W. U. Telegraph Co., February 11, 1915, Over an Atlantic Cable

as ordinary writing is known to all cable operators. Spoken language is similarly a succession of these different pattern forms, strung along one after the other, and the ear distinguishes each of these pattern forms as it arrives in the consecutive order of utterance, even as the eye distinguishes pattern forms of written or submarine cable language.

Speech may be whispered using no voice (without movement of the vocal chords). This fact was determined by actual observation of quiet vocal chords during a whispered word, "ah."

DISTINCTION BETWEEN SPEECH AND VOICE

Note the distinction between speech and voice and where each is produced, viz., voice by the vocal chords and speech through variation in the intensity of the compressed air forced through the throat, mouth, and nasal cavity. This variation in intensity is accomplished by the action of the muscles of the throat and mouth. Each person has a slightly different pitch of voice, men low and women high. An average man's voice has a pitch lying between 85 and 160 complete vibrations per second, while the average woman's voice has a pitch lying between 150 and 320 complete vibrations per second. Thus, the pitch of one person's voice is different from another's.

But speech may be produced by whispering, that is, using no voice, and whispered speech always has the same sound, no matter who is the speaker, man or woman. Any person can determine this by his own observation, getting someone to whisper with him and comparing the sound of whispers. No difference in the sound of whispers can be heard. In other words, during a whisper, speech is independent of the vocal chord action.

All previous speech records have been taken of spoken or sung words and none of whispered words on account of the lack of instruments sufficiently sensitive to record whispered speech. The resulting spoken records contained the fundamental tones and overtones of the vocal chords as well as the mouth-tones and their variations combined in so complex a curve that no one has as yet succeeded in deciphering them.

FIG. 4. SECTION OF ACOUSTICON TRANSMITTER FOR WHISPERED SPEECH

I found that the acousticon transmitter hooked up to the Einthoven string-galvanometer, as shown in the sketch herewith (Fig. 4), were very satisfactory instruments for making records of whispered speech, as they are both marvelously sensitive instruments. On account of whispered speech being inedependent of vocal chord action, it was decided to make photographic records of it from which to determine by careful study the true nature of speech. It is evident that the whispered records will not show the voice-tones and overtones but will simply show the mouth-tones and their variations in intensity. It is easy to follow the variation in intensity of one or two tones on the whispered speech records and thus pick out the intensity patterns for each letter sound which I call the phonographic alphabet.

The diaphragm is made of very thin carbon and so covers the recesses in the carbon block, without touching it, as to prevent the tiny carbon balls from falling out. The sketch shows how the acousticon collects sound from a large area and by a reflecting system concentrates it on the middle of the carbon diaphragm. There is no spring pressing on the diaphragm and it is believed that the diaphragm moves like a piston with the rarefactions and compressions of the sound waves. It is a highly damped instrument due to the weight of the carbon balls pressing against the diaphragm resisting its motion.

DESCRIPTION OF METHOD OF MAKING WHISPERED SPEECH-PATTERN PICTURES

The acousticon transmitter was placed in a large sound-proof telephone booth and supported by suspension free of all vibration. The diagram (Fig. 5) shows how the speech current flows from the acousticon through the storage battery cell, through the resistance, through the telephone receiver, through the primary side of the induction coil, and back to the acousticon; on the secondary side of the induction coil, the speech current flows through the string of the galvanometer. The string galvanometer is an electrical instrument having a fine silver-plated quartz fiber, 0.0001 in. thick, supported between two poles of a huge electromagnet. Through a hole in the magnet poles, a powerful ray from an arc lamp is focused upon this quartz fiber or string. By means of another system of lenses, the image of the string is focused upon a slot in the rotating drum-camera. When a speech-current flows through this galvanometer string, the string vibrates back and forth in a direction at right angles to the lines of force of the maget, and its lightest motion is magnified 900 times by the lens system. The shadow of the string vibrates back and forth on the camera-shutter almost exactly in proportion to the speech sounds. The camera photographs the vibrating shadow of the galvanometer string. A word is whispered repeatedly, and the speech is listened to in the telephone receiver as a check on the articulation of the words. When the shadow of the galvanometer string moves back

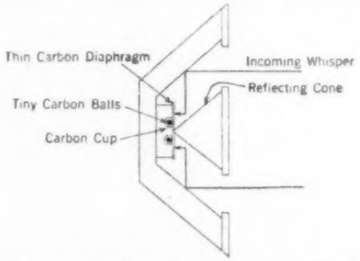

Fig. 4. Section of Acousticon Transmitter for Whispered Speech

and forth about two inches, a lever is pressed, the electrically operated camera-shutter is held open for one revolution of the wheel and a photographic record, five feet long, of the word whispered is obtained. Extra-rapid film was exposed and good photographs obtained at rates varying from 1000 feet to one mile per minute. The rate of 1080 feet was used mostly in this work, as it gave a record with good intervals between crests of speech-waves, the best record to analyze. By interrupting the light from the arc lamp 500 times per second, vertical lines were photographed upon the film at intervals

of 0.002 second by a specially constructed time-wheel, for the necessary time record.

For a consideration of the theory of the string galvanometer, I refer to Dr. A. C. Crehore on the "Theory of the String Galvanometer," *Phil. Mag.*, vol. 28, August, 1914. The amount of air and electromagnetic damping of the movement of the galvanometer string was large enough so that the motion of the string corresponded almost exactly to every component of the impressed speech currents, and the resulting speech records should be regarded as being as nearly correct records of speech as can be obtained by any recording instrument.

Speech patterns of the same letter sound are almost exactly identical for all persons and independent of age or sex of speaker. Five hundred records were obtained of three men's speech and one woman's speech which prove this. Each of the letters has its own pattern form.

From Helmholtz's formula for resonance of a spherical cavity with a small opening,

$$n = a\sqrt{\frac{3r}{8\pi^3 R^3}},$$

where n equals pitch of resonance of cavity,
r equals radius of opening of cavity,
R equals radius of cavity,
a equals 33,226 centimeters,

we can calculate the natural resonance tones of the mouth while uttering speech. I have done this and find that the resonance tones for the mouth vary from 800 to 3000 cycles per second, depending on the opening of the mouth. From our records, we find the pitches upon which whispered speech is uttered to be also from 1000 to 3000 cycles per second. This only shows, however, that pitch is an unavoidable characteristic of speech sounds. From the known facts, that a phonograph talking record may be run at more than twice the normal speed so that the speech tones must vary through more than a full octave and the speech is still quite intelligible, it is conclusive that pitch is not the main characteristic of speech sounds. That intensity variation is the main characteristic of speech sounds is well shown by the whispered speech records given, where no characteristic pitch is shown for b, d, g, k, p, t, but only the definite pattern pictures. When the speed of the phonograph is increased, this pattern is shortened and distorted as we hear, but its main form is retained and we judge it as nearly the same as the sound at the correct speed and therefore are able to understand the speech. The pitch of speech sounds then, only exists as a carrier of the speech-variations. In another paper not yet published on the Nature of Hearing and Perception, it is shown how pattern forms operate memory cells, and how we thus perceive the letter sounds of speech.

In general, the pattern form persists for at least 0.01 second and if the letter sound is sustained, the pattern repeats itself again and again. One-hundredth second is the perception time. Therefore the mouth is a device for producing patterns of the necessary length and repeating them for sure perception.

Repetitions of pattern pictures of letter sounds (several times to make up a letter sound), are due to simultaneous excitatory and inhibitory action of impulses on same or opposing muscle in the mouth or throat. At one moment excitatory impulse overbalances inhibitory impulse, then a maximum appears on the speech curve; when the excitatory and inhibitory impulses balance by interference (equal pull on muscle) no or little amplitude is shown. "A slight and rapid muscle tremor is regularly produced by the simultaneous play of excitation and inhibition on one muscle, just as 'progression' and other rhythmic movements are regularly produced by the simultaneous play of excitation and inhibition on antagonistic muscle pairs. One muscle can actually receive excitatory and inhibitory influences simultaneously, and this condition results in a peculiar and characteristic muscle 'tremor.'" (Sherrington C. S., "Nervous Rhythm," Proc. Roy. Soc., 1913, Ser. B, 86, 219-232; Forbes, A., "Reflex Rhythm induced by concurrent excitation and inhibition," Proc. Roy. Soc., 1912, Ser. B, 85, 289-298.)

The repeated use of patterns is the physiological basis of memory.

I conclude from an exhaustive search of 500 vowel and consonant curves, that an accumulator or memory cell exists in the brain for each letter sound, detecting a definite picture pattern, such as that of the letter ō which has a simple character of varying amplitudes, but repeats this character or picture pattern about 100 times a second. Since it takes 0.01 second to perceive a picture pattern (perception time for sounds), this seems the right length of time (0.01 second) for a definite picture pattern to last and then to have repetition.

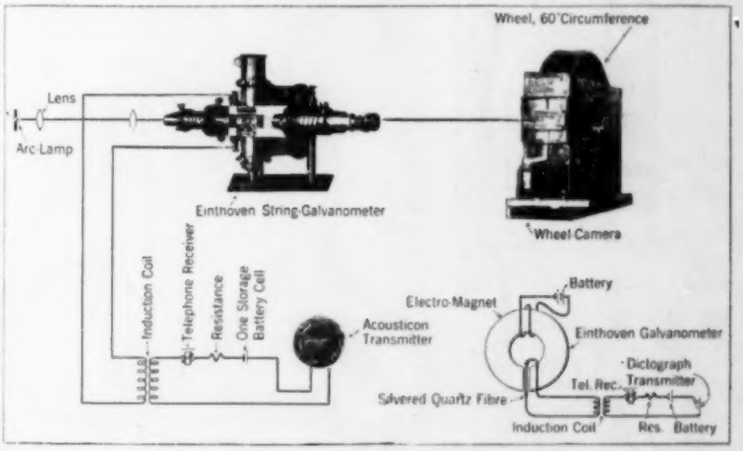

Fig. 5

Having shown that speech is made up of a set of pattern pictures of sound waves called the phonographic alphabet, it seemed feasible to design and construct a machine which would record speech automatically in ink on paper in the form of this easily read compact system of natural characters called the phonographic alphabet. This machine has been carefully designed and will be completed in the near future.

VOICE-OPERATED PHONOGRAPHIC ALPHABET WRITING MACHINE

Fig. 7 shows a wiring diagram and general arrangement of the elements of this machine. Notation on the sketch explains the function of the different parts of the device. Fig. 8, in plan and elevation, shows the mechanical arrangement of each electrical resonator circuit and how the resistance of the selenium cell is varied by the differences in the amount of light coming from the vibrating mirrors.

Method of Operation. On reference to Fig. 7, it is evident that by talking into the telephone transmitter, speech currents are caused to flow into the electrical resonator circuits. An audion may be used as a relay

if desired, to increase the strength of the voice currents. That resonator which is tuned to the main tone of the speech at any instant, will respond, the current existing in it at any moment varying in strength according to the speech-variation. The magnetic strip placed over the poles of the electrical resonator magnet will vibrate powerfully (if the electrical tuning of the electrical circuit and the mechanical tuning of the magnetic strip are of the same tone as the tone of the speech). On reference to Fig. 8, it is seen that the vibrating magnetic strip causes the connecting rod to oscillate the tiny shaft held in jewel bearings. The connecting rod is pinned to the tiny shaft only 0.004 in. from the center line of the shaft. In this way, a motion of the magnetic strip of 0.0001 in. will cause angular motion of the tiny shaft of 1½ degrees. A mirror fixed to this tiny shaft will oscillate with it and cause the beam of light from the tungsten or other lamp to be reflected onto the selenium cell. In the normal position of rest the mirror reflects the light beam onto a blank space at the middle of the selenium cell box where it has no effect on the selenium cell. When the reflected beam of light oscillates, both parts of the selenium cell on each side of the blank space will be illuminated and the resistance of the selenium will be decreased, allowing more current to pass through it from the battery and causing the electromagnetic recording pen to trace a wavy line on the paper sheet fastened to the revolving platen.

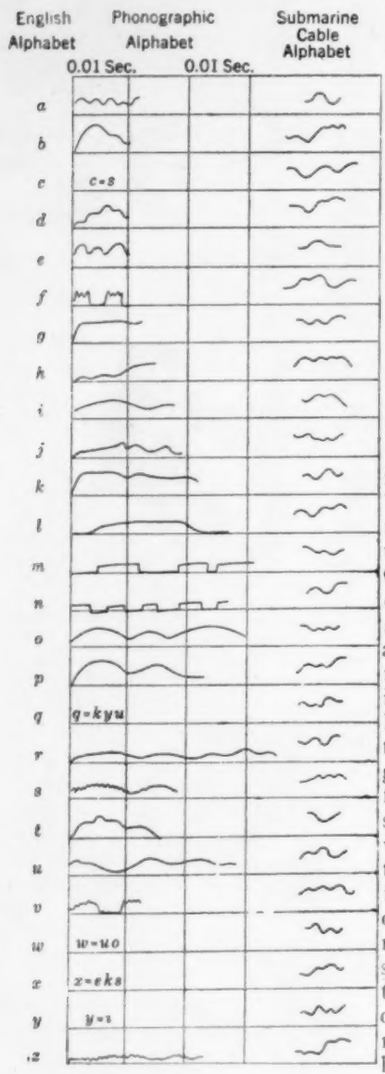

Fig. 6

To illustrate the method of operation: Let the word "go" be spoken into the telephone transmitter. From our table of the letters of the phonographic alphabet we shall expect the recording pen to write "go" in the form of ⌐·g·┴·o·┘. It is known from my research that there are present in the sound of a man's speech, principal tones of 100 cycles per second (the fundamental tone of a man's voice), 200 cycles per second (the 1st overtone of the man's voice), and a tone of approximately 1000 cycles per second (the resonance tone of the mouth for the o-position). These three tones will be moulded or varied in intensity simultaneously by the muscles of the throat and mouth, first in the g-form (a sudden explosion of the three tones) and then in the o-form (a quick waxing and waning of the three tones). Three tuned

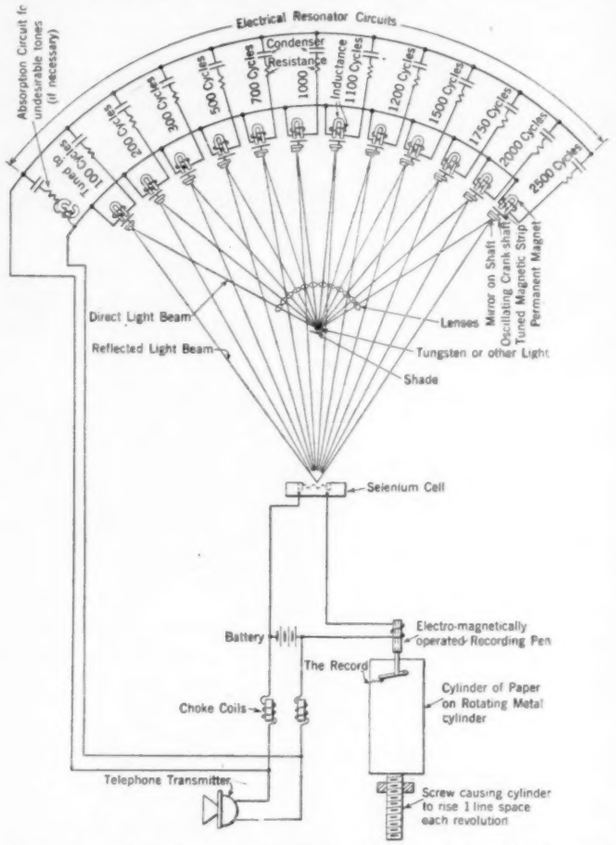

Fig. 7. General Arrangement and Wiring Diagram of the Voice-Operated Phonographic Alphabet Writing Machine

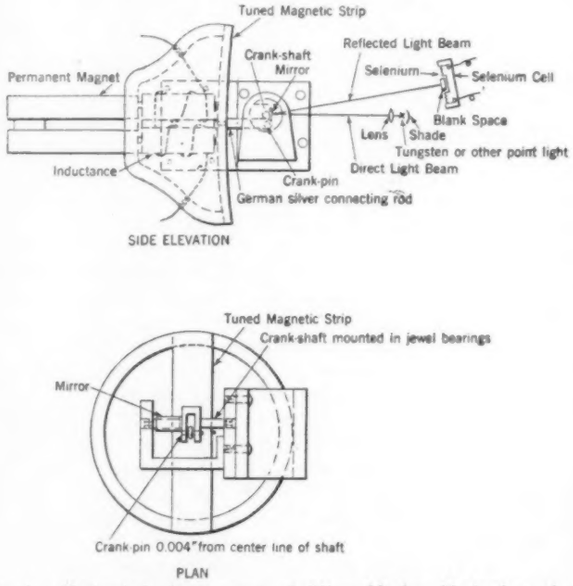

Fig. 8. Mechanical Arrangement of Mirror-Moving Mechanism of the Voice-Operated Phonographic Alphabet Writing Machine

electrical resonating circuits marked respectively 100, 200 and 1000 cycles will simultaneously respond to the three tones and three beams of light will oscillate over the face of the selenium cell, each vibrating after the same pattern at the same instant of time. The current in the selenium cell and in the recording-pen magnet will vary in strength, first according to the g and then to the o-form, causing the writing in ink on the rotating paper cylinder of ~~~ . In the same way, all letter sounds are written and we thus have a visible-writing machine recording our thoughts as rapidly as we speak, in the natural alphabet.

This work was conducted by co-operation of the department of physiology, College of Physicians and Surgeons, New York, and the Underwood Typewriter Company.

Determining the Mean Length of Life

Depreciation Data Adapted From an Article in Science by W. J. Spillman

IN determining the cost of public utility operation one of the most difficult items to determine accurately is the rate of depreciation of equipment. Apparently a solution for this problem has been found. The solution applies to all objects, either animate or inanimate, lasting for varying lengths of time.

Two cases are to be considered, namely, (1) when the number of the objects under consideration is approximately constant from year to year, and (2) when their number is increasing or decreasing. The first case may be conveniently considered in its application, for example, to telephone poles. Suppose that in a given system there is a definite number of pole lines of various ages, and that as fast as old poles become unsuited to their purpose they are replaced by new ones. For convenience of reference let us reduce the numbers with which we have to deal to symbols. Let N_1 represent the number of poles in their first year of life, N_2 the number in their second year, N_3 the number in their third year, and so on, N_n representing the number of poles of the oldest age represented in the group.

In any group of objects which lasts for varying lengths of time but in which the number of objects is kept constant by replacing discarded ones by new ones the following principles apply:

1. The number of old objects discarded each year is, on the average, equal to the number of new ones introduced.

2. The average number of objects in the second year of their life at a given time is equal to the average number of those in their first year that will live to enter their second year. The average number in their third year is on the average equal to the number of those in their first year that will live to enter their third year, and so on. In general, the number of objects in their *n*th year is equal to the number of those in their first year that will live to enter their *n*th year.

3. Hence N_2, N_3, etc., which represent the number of objects now in their second, third, etc., years of life, may also be taken to represent the number of the objects now in their first year that will ultimately reach their second, third, etc., years of life.

4. If now we add together N_1, N_2, N_3, etc., this is equivalent to counting each object now in its first year as many times as it will live years. Hence the sum of N_1, N_2, N_3, etc., which represents the total number of objects of all ages, also represents the sum of the ages that will be attained by all the objects now in their first year.

5. Therefore, if we divide the total number of objects of all ages in the group by the average number in their first year the quotient will be the average length of life that those now in their first year will live. But since the average number of objects in their first year is the same from year to year, this average is a general one and applies to the whole population. We may thus express the average length of life of any constant population by means of the following formula:

$$L = \frac{N_1+N_2+N_3+\ldots+Nn.}{N_1} \qquad (A)$$

This formula may be expressed more simply by writing for the numerator simply the total population instead of the sum of individuals of different ages. We thus have

$$L = \frac{P}{N_1}. \qquad (B)$$

In this formula L equals the average length of life, P the total population, and N_1 the average number in their first year of life at a given time.

In applying either of the above formulæ to cases like those of buildings and most kinds of equipment the fact that very few such objects are discarded until they are at least four or five years old makes N_1, N_2, N_3, N_4 and N_5 approximately equal. That is, the number of objects one year old is about the same as the number two years old, or three years, etc., up to about five years, and sometimes even longer. In making a study of such objects with a view to determining the average length of their life it is usually possible to get quite accurately the number of objects in the group in each year of life up to five or six years of age, and where these numbers are about the same for each year their averages will represent quite accurately the average number of new objects introduced in a year, which is the same as the average number of old ones discarded. Hence, in groups where the number of objects in each of the earlier years of life is approximately the same, the average length of life may be obtained by dividing the total number of objects by the average number in each of the early years of life.

The principles stated above do not apply in a group that does not remain constant from year to year. It is not difficult, however, to work out a formula based on formula (A) above that does apply to such groups. This may be done as follows:

Suppose the rate of increase is 1 per cent a year. Then if P represents the number in any one year, $1.01P$ will represent the number the next year. Likewise, if B represents the number of objects new in any year, then $1.01B$ will represent the number the next year. In general, if B represents the number of objects new in any year and r the annual rate of increase, then $(1+r)B$ will represent the number of objects new the first year thereafter, $(1+r)^2B$ the number new the second year thereafter, and $(1+r)^nB$ the number new the *nth* year thereafter.

Returning now to formula (A), where N_1 represents

the number in the first year of life, N_2 the number in their second year, and so on, we have already seen that in a constant group these numbers bear such relation to each other that N_2 represents the number of the present N_1's that will live to enter their second year. But in an increasing group this is not the case, for the number of objects new in the year in which the present N_2's were new was smaller than the number new in the year in which the present N_1's were new—that is, the number new last year is smaller than the number new this year. Hence, in an increasing group N_2 is smaller than the number of N_1's that will live to enter their second year. But if we increase N_2 in proportion as the number new this year is greater than the number new last year, this increased value of N_2 will represent the number of the present N_1's that will live to enter their second year.

If we let B stand for the number new in the year in which the present N_2's were new, then $(1+r)B$ will represent the number new the year the present N_1's were new, which of course is just one year later. The increased value of N_2, for which we are seeking, may now be found from the proportion

$$B : (1+r)B :: N_2 : X,$$

from which

$$X = (1+r)N_2.$$

In similar manner it can be shown that if we substitute for N_3 the expression $(1+r)^2N_3$ this new value will represent the number of present N_1's that will live to enter their third year, and so on for all of the various N's in the numerator of formula (A). This gives us

$$L = \frac{N_1+(1+r)N_2+(1+r)^2N_3+\ldots+(1+r)^{n-1}Nn.}{N_1} \quad (C)$$

In this new formula the terms of the numerator represent, respectively, the number of the present N_1's that will live to enter the various years of life indicated by the subscripts after the N's. Hence the sum of the terms of the numerator is equal to the sum of the ages the present N_1's will reach, and the value of the whole fraction becomes the average length of life of the group of objects.

To use formula (C), which applies to groups that are increasing or decreasing at a constant rate, r, we must know the number of objects in each of the various years of life at the present time and the annual rate of increase or decrease in number. Such data are usually not available except in the cases of human beings in restricted areas where births and deaths are accurately recorded. In some cases, however, it may be possible to obtain data of this kind concerning a class of articles of equipment. When this is possible, the average length of life may be calculated where the number of objects is increasing or decreasing at a constant rate per year.

It will be noticed that when r is equal to zero, which it is in a constant group, formula (C) becomes identical with formula (A).

Formula (C) applies only to groups in which the *rate* of increase or decrease is the same from year to year. It is possible to develop another formula for the average length of life which is independent of the rate of increase and which therefor applies no matter what the rate of increase or decrease, and whether this rate is the same from year to year or not.

Let B_3 represent the number of objects new the year the present N_3 objects were new, and B_1 the number new the present year. Then the proportion $B_3:B_1::N_3:X$, in which X is equal to $(B_1/B_3)N_3$, gives a value which if used instead of N_3 makes the third term of the numerator of formula (A) represent the number of the present N_1's which will live to enter their third year. The other terms of the numerator of formula (A) may be modified in similar manner, giving the formula

$$L = \frac{N_1+\frac{B_1}{B_2}N_2+\frac{B_1}{B_3}N_3+\ldots+\frac{B_1}{Bn}Nn}{N_1}, \quad (D)$$

which is applicable to all groups for which we have the following data: the number of objects new each year since and including the year in which the oldest objects now in use were new, and the number of objects of various ages now in use.

While formula (D) has very wide applicability, its usefulness is greatly limited by the fact that it requires so large an amount of data which is usually difficult to obtain.

In using any of the methods here presented in determining the average rate of depreciation of equipment of a given kind, only those objects are to be counted that were bought new (not second hand) and which will presumably be replaced when destroyed or worn out by new ones.

Telephoning from the Body

Prof. D'Arsonval lately presented to the Académie de Médecine an interesting series of researches made by Dr. J. Glover upon a new method of telephoning in which the microphone transmitter is placed against the human body. He had the habit of making an auscultation of patients by using a telephone transmitter placed upon the body, while the observer listens in the receiver, and found that when the person spoke, his voice was heard in the receiver much more distinctly than in the usual way of speaking before the microphone. In fact, the sounds are transmitted better by the body than through the air, and all outside noises are eliminated such as often cause disturbances. Thus it is an easy matter to telephone with face and hands free and with the transmitter applied say on the chest or back. In this case the voice is heard in the receiver with remarkable clearness, and this precision is also shown by the oscillograph curves which he made. Such a method of telephoning might possibly be put to practical use.

Radiophone Successful in Winter Maneuvers

Important experiments in radio telephony are being conducted by the Atlantic fleet during its winter maneuvers off Cuba. These are the result of the successful outcome of experiments carried on for the past year by the American Telephone & Telegraph Company and the Western Electric Company in co-operation with radio stations under the jurisdiction of the Navy Department by which long distance wireless telephony has been made possible. The experiments are being carried on in an effort to ascertain the military application of the wireless telephone to the work, tactics and strategy of a great battelship fleet.

Radio-telephone transmitters have been installed on the *Wyoming*, Admiral Fletcher's flagship, and on the *Texas*. These transmitters are being used in sending messages to the other units of the fleet, which, while not equipped with the telephone transmitters, are able to receive the messages by means of radio-telegraphic sets.

Methods Employed in Valuation

Presented at the Convention of the Wisconsin State Telephone Association

BY C. M. LARSON*

THE problems confronting managers of telephone plants are many and varied, but it is not the purpose of this paper to enumerate or discuss them. There are, however, certain general classes of those problems which are of especial interest to the state department of engineering, as they require investigations and valuations by that department for the railroad commission. Under the present statutes, the state department of engineering is required to do all engineering work of whatever nature, including valuations, for the railroad commission as well as for all other branches or departments of the state government.

Valuation of the property of a telephone company may be required for various reasons—either for purchase, consolidation, rate increase, decrease, or adjustment—and an idea of the magnitude of this work in Wisconsin may be had from the fact that there are about 806 telephone utilities with over 1,000 exchanges in this state besides the Wisconsin Telephone Company with 78 exchanges. The railroad commission receives reports from about 257 companies, including the Wisconsin Telephone Company. These 257 reports show a mileage of pole line in the state of about 25,000 miles, with a total of about 200,000 telephones. A great many telephone properties have been constructed and operated without due consideration having been given to the total costs of operation. Telephone plants, like all other property, depreciate with use and time, and unless due provision has been made for this depreciation in the schedule of rates, a time is reached when it becomes necessary either to raise rates or give inferior service. Either one of these alternatives is likely to result in dissatisfaction to some of the patrons. In any event, the case often comes before the railroad commission either in the form of an application of the company to increase or adjust rates, or a complaint of the patrons of the quality of service; the latter often being accompanied with a demand for decreases in rates.

Whatever the occasion of the investigation, if the commission orders a valuation of the property, the engineering department proceeds along certain lines which are the result of a number of years of study and experience. In making the valuation, a great deal of labor and expense can be saved this department and much better and more satisfactory results can be obtained by the co-operation of the officers of the company. This paper has therefore been prepared with a view of placing before the companies certain of the details of the methods employed in constructing an inventory and making a valuation in order that they themselves may assist us, and thereby obtain the best possible results at the least cost.

In making a valuation, three sets of figures are desirable, namely: the original or actual cost of the property now used, the cost of reproduction new of the property now used, and the cost of reproduction less depreciation.

ACTUAL COST.

If it is possible to determine the actual cost in place of the various units of a property, this figure is of great assistance to the commission in arriving at a final figure representing the real value. The determination of the actual cost of the property now used generally involves two processes. First, for the items whose cost is actually shown by the books of the company, the process is simply that of compiling such cost in a way that will permit of ready checking and grouping under proper headings. It is unusual, however, to find a property that has been in existence more than a few years whose bookkeeping has been such that the actual cost of all items is thus available. In cases where the cost of a certain item is not ascertainable from the books, an estimate, based upon market conditions of labor and material at the time of the installation of the item, should be made and this figure applied. By this method it is often possible to approximate very closely the actual cost of the property now in use.

Even though we may be able to make a fair determination of the actual cost of the property, it is usually necessary to determine the other two sets of figures, namely, cost of reproduction new, and cost of reproduction less depreciation. The methods to be pursued in these cases are entirely different from that of the estimate of actual cost, and they will be described in order.

COST OF REPRODUCTION NEW

Cost of reproduction new means an estimate of the total cost of replacing the present property with new units of the same kind, size and quality as those now used. If present units were second-hand when installed, then corresponding second-hand units should be estimated. The first requirement is a complete inventory of the property arranged about in the following order:

A. LAND:
- A 1—Central Office Land.
- A 2—Other Lands.

B. DISTRIBUTION SYSTEM:
- B 1—Poles and Wire Supports.
- B 2—Aerial Wire.
- B 3—Aerial Cable.
- B 4—Underground Conduit.
- B 5—Underground Cable.
- B 6—Substation Equipment.

C. BUILDINGS AND MISCELLANEOUS STRUCTURES:
- C 1—Exchange Buildings.
- C 2—Miscellaneous Buildings.

D. EXCHANGE EQUIPMENT:
- D 1—Manual Equipment.
- D 2—Automatic Equipment.

E. GENERAL EQUIPMENT:
- E 1—Utility Equipment.
- E 2—General Office Equipment.
- E 3—Miscellaneous Equipment.

F. PAVING:
- F 1—Paving Over Trenching (which has not been actually paid for by company).

H. MATERIAL AND SUPPLIES:
- H 1—Distribution System Supplies.
- H 2—Central Plant Supplies.
- H 3—General Office Supplies.
- H 4—Miscellaneous Supplies.

The most satisfactory and economical method to be used in collecting the data for the inventory will depend upon the circumstances surrounding each case. If a carefully prepared, descriptive map of the system is available, the quantities of wire, poles, cross-arms, insulators, brackets, etc., may be taken directly from this and a great deal of field work avoided; but if no such map is available it becomes necessary to correct the data by actual inspection on the ground. It will readily be seen that if a system map were kept by each company and kept up to date, the work of preparing an inventory would be a simple matter. Our department has prepared tracings of each county in

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the state on a scale of one-half inch to the mile, showing all highways. It is our intention to send blue line prints in duplicate to each telephone company having rural or toll lines, with a request that one copy be returned to us showing the location of all such lines owned by the company, and showing also the number of wires on each line, type of construction, etc. It is not our expectation or desire that the companies shall go immediately into the field to gather this data. From a knowledge of the lines it is a simple matter for the superintendent or manager to lay out on the map the location of all lines. As he or his assistants travel over various parts of the system they can very readily take such notes as are necessary to complete the descriptive map. The system might well be divided into sections representing different types of construction, different number of wires, etc., and if this is systematically done when the repairman is making his regular rounds, the result will be a record that will be of immense assistance and usefulness both to the company and to this department, and the expense will be but nominal. All this must be collected for an inventory and if made as suggested above the cost is much less than it will be if special trips are made for this purpose alone.

The scale of the maps which we propose to send out is so small as to render them unfit for use in cities and villages. When making an inventory of such property it is advisable to obtain some kind of plat maps and record the data on these.

In making an inventory of property to be used as a basis for estimating the cost of reproduction, the following points must be kept in mind:

First, make the inventory as complete as it is reasonably possible to make it.

Second, secure and record descriptions and other information in sufficient detail to permit of a price being applied to each item.

Third, collect and record sufficient data to insure a fair estimate of the depreciation of each item.

Referring to the first statement above, it is seldom that an inventory is made without the omission of important items, often of considerable value. If a telephone line is constructed in a street or on a highway, it is often necessary to trim trees, to obtain a permit therefor, and sometimes to obtain a permit even to construct the line adjacent to certain property. If a trench for a conduit is being dug, it is often necessary to shore up buildings, or to rearrange water or gas pipes. All such items cost money and should be given consideration. Even differences in soil conditions which affect the cost of placing poles should be noted, and in fact anything that might have a bearing, directly or indirectly, on cost of construction should be made part of the record in order that all conditions that might influence the valuation may receive due consideration.

PRICING

The next step is the placing of unit prices on each item in the inventory. The word "price" as here used includes freight, haulage and storage costs on materials, and liability insurance on labor. During the collection of the data for making the inventory, the necessary information must have been obtained in order that prices may be applied intelligently. It is our aim to place upon each unit a price which will represent the fair cost of labor andn material to install the unit in place for operation. In determining these prices many things must receive consideration. Market prices of various materials fluctuate so much that it is desirable to obtain a price which represents the normal price. For material such as copper or iron wire, a normal price may usually be obtained by averaging prices for a period of years. This method may not be applicable to other items, some of which may have a tendency either to rise or to fall consistently. It is, in any case, necessary to try to determine the trend of prices and use a figure which will represent a fair average after taking into account all available information which might influence prices either up or down. Actual cost is excellent as a price if conditions have not changed since such cost was incurred.

Prices should be applied in detail to each unit of the property and when thus applied, extended and summarized, the result will represent a fair amount to allow for cost of reproduction of the property new. To this must be added certain overhead costs which will be discussed later.

DEPRECIATION.

The cost new less depreciation of the physical property is obtained by deducting from the cost new of each unit an amount equal to the estimated loss in value of the unit due to wear and tear, weathering, inadequacy or obsolescence.

We all know that no piece of construction lasts forever. Poles may have a life ranging from 6 years or less, to 20 years or more, depending on the kind of wood, climate, weather conditions, soil, method of setting, maintenaance, etc. Under known conditions, the average life can be estimated quite accurately, but inspection should be made of the actual condition of a large number of the poles to determine whether or not this estimated life is correct for the particular property under consideration. Wire and other items should receive similar treatment. Switchboards are not subject to depreciation of the same type as are the poles, but because of inadequacy or for other causes, even switchboards have to be removed or replaced in time. So on with each item. A life which will be fair under existing conditions should be applied, and with the age known or estimated, it is possible to assign a figure which will represent either the present value or the depreciation, as a per cent of the cost new.

These figures should be set down in columns parallel to the figures representing the cost new, and when totaled by groups, represent the cost of reproduction less depreciation of the various items of property.

OVERHEAD CHARGES.

As stated above, the figures that are applied to the various items represent simply labor and material costs (including freight, haulage, etc.) of placing the units in position. There are many items of cost which it is difficult to assign or apportion to each unit of the property. Such items as general organization expenses during the construction period, legal expenses, engineering and general supervision, interest on money invested before operation begins, taxes during construction, etc.—these, which we consider a part of the actual cost of construction, are usually applied as an overhead to the entire property or to individual groups separately. They are sometimes calculated as a per cent of the specific cost of construction and sometimes estimated as a lump sum and applied. But, however these overhead costs are applied, a study should be made of the fair amount to allow for the particular property under consideration. In making an inventory, it is quite impossible to succeed in listing 100 per cent of the property, and it has been customary to allow a small per cent of the total for omissions, the amount varying with the care with which the inventory is prepared. It should be the aim, however, to

list every item possible as a part of the inventory upon which prices may be applied, and thus keep at a minimum the amounts to be applied as overhead costs.

OTHER COSTS.

In estimating the value of the physical property, the cost of labor and material, properly treated, is considered as the specific cost of construction. To this are added the costs for overhead enumerated above. When dealing with the physical property only it is usually considered that no other items of cost will be applied, since the above estimate is intended to include every item of cost of the physical property. There are often other expenses, however, that the utility must bear between the inception of the project and the time the property becomes a self-sustaining or paying concern. These may be generally listed as follows: Cost of preliminary investigations; organization of the utility; raising capital; commissions on sales of securities; discount on bonds; cost of obtaining business, etc. These matters are not generally handled by the engineering department, as they are not necessarily a part of the actual cost of the physical property. For that reason they will not be dwelt upon in this discussion.

The object of this paper is to state briefly, for the benefit of those who have not yet had experience in this line, some of the primary considerations that should receive attention in making a valuation. This is done with a view of encouraging each company to perfect its methods of keeping records in order that a valuation may be made readily and economically, in case of necessity arising therefor. The department of engineering is always very willing to offer suggestions relative to any specific case and will welcome inquiries, either by letter or by personal calls from any utility owner interested.

Field Telephones Meet Peculiar Conditions

Abstract of a Paper Read Before the Royal Society of Arts, London, by Charles R. Darling

IN the greatest of all wars, the combatants on both sides find that the telephone is an indispensable adjunct in the conduct of operations in the field. By its aid communication is established between the various units, guns are fired according to orders conveyed by telephone from the battery observer, and in nearly all cases where it is necessary to keep two or more stations in touch the telephone is used. Flag signaling, being too conspicuous, has practically been abolished; and the present war has rightly been termed a "telephone war."

The telephones to which we are accustomed in civil life are unsuited to military operations for two reasons. First, they lack portability; and, secondly, they are not provided with a means of transmitting messages by Morse code in the event of speech being inaudible. It has, therefore, been necessary to design special instruments for use in the field.

The usual arrangement of parts in field telephones follows on the lines indicated in Fig. 1. The primary circuit consists of a battery, *B*, connected to the primary winding of an induction coil, *P*, and to the vibrator or buzzer, *V*, through the key, *V K*. The microphone or

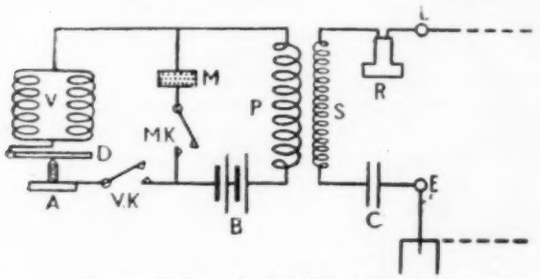


Fig. 1.—Typical Circuit of Field Telephone.

transmitter, *M*, is placed in parallel with the buzzer, and may be brought into the circuit by means of the key, *M K*.

The secondary circuit consists of the receiver, *R*, one end of which is connected to line and the other end to the secondary winding, *S*, of the induction coil, which in turn is joined to earth through a condenser, *C*. The arrangement at the other end of the line is identical with the foregoing, and to establish communication the operator at either end connects the line to the terminal, *L*, and attaches the terminal *E* to an earth-pin driven into the ground. In different forms of field telephones this circuit is modified in various ways. Most modern instruments possess a third terminal, placed between the condenser and the secondary winding of the induction coil, so that the condenser may be cut out or brought into the circuit as desired. In the Stevens telephone the induction coil serves to operate the buzzer; in the service instrument, known as the "D Mark III," the buzzer windings perform the functions of the induction coil, and a second receiver, inserted in parallel with the first, is provided. The circuit shown in Fig. 1 may, however, be regarded as the fundamental type upon which the others are based.

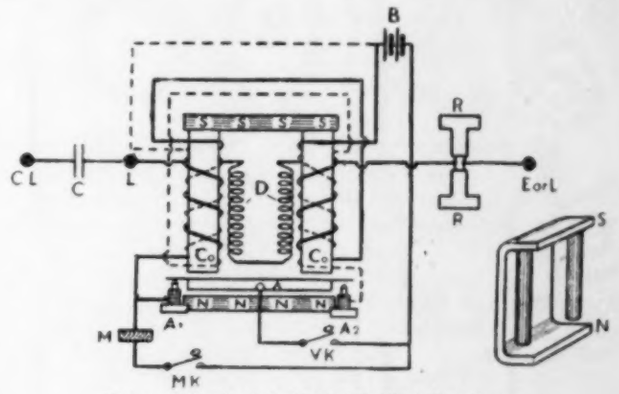


Fig. 2.—Circuit of D Mark III Field Telephone.

In the regulation service telephone the battery consists of two "dry" cells, of external dimensions 3¼ × 1½ × 1½ inches, connected in series.

Operation. Two cells in series used.	*current (amperes).*	*Useful life of cell.*	*Final voltage.*
Using simple buzzer	0.2—0.3	15 hours	1.2 or less
Using polarised buzzer.....	0.1—0.15	25–30 "	"
Speaking through microphone.....	0.2—0.4	12 "	"

Frequent renewal of cells is necessary when the telephones are in active use. The best clue to the condition of a cell is furnished by the readings of a voltmeter placed across its terminals, and any cell showing a less figure than 13 should be replaced by a new one. Volt-

meters used for this purpose should be of the moving-coil pattern, and capable of reading accurately to 1/10 volt.

The induction coil used in field telephones is usually 2 to 3 inches long. The resistance of the primary winding is about 0.5 ohm when used with a simple buzzer, and about 3 ohms when in conjunction with a polarized buzzer, as in the D Mark III. The secondary winding possesses about 30 times as many turns as the primary.

The buzzer or vibrator serves the double purpose of acting as a call-up, and also as a means of transmitting messages by Morse code. In the simple form, the action is identical with that of an ordinary electric bell. Referring to Fig. 1, the buzzer *V* is seen to consist of two windings, through which the current from the battery divides. These windings are provided with iron cores (not shown in the drawing), and the path of the current is continued through the iron armature *D*, and the adjusting screw *A*. When a current passes through the windings, the cores are magnetized, and attract the free end of *D*, thereby drawing it away from *A* and breaking the circuit. The cores then lose their magnetism, and the armature springs back and renews contact with *A*, thus restoring the circuit. The rapid to-and-fro movement of *D* gives rise to a buzzing sound, whence the arangement derives its name. As the buzzer is in circuit with the primary of the induction coil, every make and break of the current caused by the vibration of *D* will give rise to an induced current in the secondary, which, passing through the line circuit, acts on the receivers so as to reproduce the note emitted by *D*. The key, *V K*, is used as a Morse key for the purpose of sending messages, a long contact representing a "dash," and a short contact a "dot."

The objection to the simple buzzer described, which is used in the service D Mark II field telephone—now becoming obsolete—is that the note lacks sharpness, and is not suited to the rapid transmission of message. In the Stevens field telephone the core of the induction coil, which becomes magnetized when a current passes through the primary, is used to attract the armature, a plan which simplifies construction by dispensing with the separate buzzer coils. A polarized buzzer, such as will be described later in connection with the D Mark III telephone, is preferable to a simple buzzer, as it requires less current to work and gives a sharper note.

For economy of weight and space, the receivers of field telephones are made in the "watch" form, wound

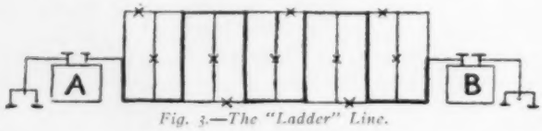


Fig. 3.—The "Ladder" Line.

with coils of combined resistance about 200 ohms. For convenience of rewiring, the terminals are, or should be, placed on the exterior of the case.

The microphone or transmitter consists of a replaceable capsule contained in a metal case, the top of which screws on to the lower portion, and holds the capsule in position. The capsule contains a carbon block, with cavities in its upper surface, which are filled with small spherical granules of carbon. Touching the granules is a carbon disk, protected from moisture by a covering of mica. When in use the current from the battery passes through the granules, and when the carbon disk is vibrating, the area of contact at this part of the circuit is constantly changing. This results in changes in the strength of the current, and as the primary of the induction coil is in the circuit, induced currents are produced in the secondary and its connections, which cause the diaphragm of the receiver to vibrate in unison with the disk of the capsule.

Although not essential to the transmission of sounds, a condenser, inserted in the line circuit, is a useful adjunct to a field telephone. It is made up of alternate sheets of tin-foil and paraffined paper, and possesses a capacity of 1/30 to 1/40 microfarad. A condenser, whilst stopping the passage of direct currents, permits alternating currents to pass through, although somewhat impaired in strength. Owing to this property, a pair of field telephones, with their condensers in circuit, may be attached to an existing telegraph line, and messages sent without interference. The direct currents used in telegraphy cannot pass through the telephones owing to the condenser; the alternating currents due to the telephones do not affect the telegraph instruments; and hence both operations may proceed simultaneously. This fact is frequently taken advantage of in the field. It is also customary to use a condenser in the circuit when tapping a telephone line, as less current is then diverted through the instrument used for tapping, and the communication from end to end is not unduly interfered with. In the D Mark II telephone a condenser is permanently in the circuit; in more modern forms, such as the D Mark III, Stevens, and Siemens instruments, the use of the condenser is optional, and is only resorted to for the special purposes mentioned above.

The use of an earth return for a field telephone has the advantage of saving a second line, with the attendant trouble of laying out. Contact with the ground is secured by means of a pointed iron pin, about 14 inches long and ¾ inch in diameter, which is driven in to a depth of several inches. This pin carries a terminal, and is connected to the telephone by a short wire. In damp ground a pocket-knife, or even a wire inserted into the ground, gives sufficient contact. In dry, sandy ground it is difficult to secure a good "earth," and it is necessary to pour water round the pin. Should this fail, a return wire must be used.

In the D Mark III and Siemens telephones a metal base, permanently connected to the earth terminal, is provided, so that when placed on the ground an earth-pin is unnecessary. The International Electric Company provides a special heel-plate, to which a wire from the telephone may be attached, so that a telephonist may use his instrument while walking.

The service D Mark II pattern was much used at the commencement of the war. It superseded an older and smaller form known as the Mark I, but is in turn being rapidly replaced by the Mark III. It possesses a simple buzzer, mounted with the induction coil on a fibre block. Beneath this are placed two dry cells, and a metal box containing two condensers, one of which is connected permanently to the line circuit, and the other placed across the buzzer terminals to diminish sparking at the contact with the armature. The microphone and receiver are connected by flexible copper wires to terminals on the top of the fibre block; and the whole is contained in a leather case provided with pockets for holding the microphone and receiver when not in use. The line and earth terminals protrude from the side; and a soft portion of the leather lid enables the buzzer to be worked without opening the case. A shoulder-strap is provided, and the total weight is about 5½ pounds. The circuit is

identical with Fig. 1, with the addition of a condenser between the armature D and the screw A.

The chief defects of the instrument are the unsuitable character of the buzzer for Morse signaling; the high current required to work the buzzer, which soon exhausts the cells; and the liability of the connecting cords of the microphone and receiver to breakage. It requires constant supervision to keep in order, and its complete withdrawal in favor of the D Mark III will be an unmixed advantage.

The special features of the D Mark III telephone, which is the latest service pattern, are the use of a polarized buzzer, and the arrangement by which the windings round the cores of the buzzer are made to constitute the induction coil. The circuit is shown in Fig. 2, and at first sight appears complicated. The action of the buzzer resembles that of the polarized bell used in ordinary telephones, but whereas this bell is actuated by an alternating current, a direct current only is available for the buzzer. The same result is secured, however, by causing the battery current to pass alternately through each of two windings round the cores, which, being oppositely disposed, produce opposite magnetic effects. The iron cores, C_o, are mounted on the south pole, S, of a permanent magnet bent twice at right angles, as shown at the side of Fig. 2. The lower extremities of the cores will therefore possess S-polarity. An iron armature pivoted at its center is placed between the ends of the cores and the N-pole of the permanent magnet. The upper face of this armature has N-polarity, and carries at either extremity a thin strip of steel. In the position of rest, one of these strips touches an adjusting screw A_1, the other being free of the screw A_2. Each core possesses two windings, one right-handed and the other left. On pressing the buzzer key, $V\,K$, the current flows through the armature to the screw A_1, and thence round the cores by the path indicated by the full line. This results in the S-pole of the core opposite A_1 becoming strengthened, while that of the core opposite A_2 is weakened; and hence the armature is drawn away from A_1 and makes contact at the other end with A_2. The circuit completed by this contact is shown by the dotted line, and the effect now is to strengthen the S-pole opposite A_2, and to weaken the other. Hence the armature leaves A_2, and again makes contact with A_1, and thus is set into rapid vibration. When the screws are properly adjusted, so as to make the throw of the armature even on both sides, a keen, sharply-defined note is obtained, suited in every respect to calling-up or rapid Morse signaling. This buzzer requires a minimum current of 0.1 ampere for satisfactory working, this being only about one-half that needed for a single buzzer. A better result is thus secured, with less current, and consequent extension of the life of the battery.

The secondary of the induction coil, D, shown in the drawing at the sides of the cores, is wound over the buzzer coils, and every make or break of contact between the armature and the screws results in the production of an induced current in the secondary circuit, which, passing through the line and receivers at both ends, produces a response to the note of the buzzer.

The microphone, M, is connected so that when its key, $M\,K$, is pressed the current passes through the full-line winding of the buzzer cores, which then serves as the primary of the induction coil, the fluctuation in current caused by speaking into the microphone resulting in induced currents through the secondary circuit as in the case of the buzzer.

Two receivers, R, are used, joined to the same terminals. The terminal marked L or E is connected to a metal plate at the base of the instrument, which serves as earth contact. The condenser, C, is placed between the terminals L and $C\,L$, and is only in the circuit when the line is connected to the latter.

The instrument consists of two compartments, provided with lids, the taller containing the cells and the lower the buzzer and condenser. On the lower lid are mounted the buzzer key, terminals for the two receivers and microphone, marked R and M respectively; and also

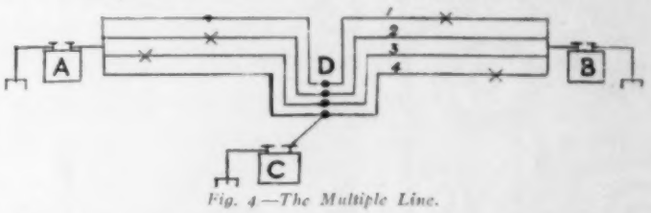


Fig. 4—The Multiple Line.

three terminals lettered L, $C\,L$, and L or E, for connection to line and earth. The buzzer itself is fastened on the under side of the lid, and the condenser is at the bottom of the compartment. One of the two receivers is contained in a leather case provided with a head-strap, so that it may be fastened to the ear when awaiting a call, leaving both hands free. The other receiver forms the upper part of a hand combination, which may be telescoped into a small size for packing; the lower part being the microphone, the key of which is in the handle. For transit, all the parts are placed in a leather case, 8½ inches by 4 inches in plan, and 6½ inches high, to which a shoulder-strap is attached. The total weight is a little over 8 pounds.

The use of two receivers is a distinct advantage. If the cords of one should break the other may still be used, and the line circuit remains intact. A very important message may be heard simultaneously by two men, the risk of misinterpretation being thereby greatly reduced. Further, one of the receivers may be detached and re-wired if necessary, without putting the telephone out of action. The clear note of the buzzer is of great value, as Morse code messages are frequently the only means of communication in the firing line, talking being inaudible. The only weak point is the tendency of the connecting cords to break, and this might be overcome by the use of stranded steel wire instead of copper. With this improvement, and renewal of the cells when the voltage of each falls below 1.3, this telephone would remain in order under all normal conditions.

The lines for field telephones are made of steel wire, which possesses greater mechanical strength than copper wire, and is, therefore, not so easily broken. A thin, single-stranded steel wire, with an insulation of varnish, is much used when a temporary communication has to be established, or when a body of men moving forward have to keep in touch with the rear. Such a wire has the advantage of lightness, and a considerable length may be contained on a small reel. For work of a more permanent character, wires composed of several steel strands, and insulated with rubber and woven fabric, are used, and are less liable to short circuits to earth than the former. Reels of different sizes, according to the length of wire contained, are employed; the smaller reels are carried on a body-belt by the lineman, while the larger are mounted on special barrows. The lines are laid on the surface, or placed a few inches underground, according to circumstances, and in the latter case perfect insulation

is absolutely necessary. In laying a surface wire between two stations, the safest route, even if circuitous, is taken. Open spaces are avoided, the wire being laid along a hedgerow in preference to crossing a field. If a road has to be crossed, two trees or other suitable objects are chosen, the line to be tied to the base of the first tree and drawn tightly up the trunk, and then passed over a suitable fork at a minimum height of 15 feet. It is then passed over a fork on the opposite tree, drawn tight across the road and down the trunk, and secured at the base. In the absence of trees or poles the line must be buried in the road. A line should, if possible, be kept at least 10 yards away from any other line, otherwise induction effects will give rise to cross-talk in both, and cause confusion.

The breaking of telephone lines by fragments of bursting shells is a very common occurrence, and as the cutting-off of communications may have very serious results, measures are taken to maintain a complete circuit as long as possible. To this end multiple lines are used, and one arrangement, known as the "ladder" system, is indicated in Fig. 3. The wire is formed into a network resembling a ladder, with a connection at either end to the telephones *A* and *B*. Although numerous breaks may occur, as indicated by the crosses, a continuous circuit from *A* to *B*, marked out by the thick line, still exists. Networks of this kind are sometimes buried in the ground, and enable communication to be kept up for long periods. The method has two drawbacks: first, a large number of joints have to be made during laying; and, secondly, each break is liable to cause a short circuit to earth, difficult to locate, which would prevent messages passing between the two ends.

An alternative method is shown in Fig. 4, where four lines are laid between the telephones *A* and *B*, which at one spot are brought to junctions *D* in a dug-out, where a lineman is placed provided with a telephone, *C*. It must be understood that the lines, shown parallel in the drawing, may take widely different routes between the ends and the dug-out. As indicated by the crosses, all the lines are broken; *1* and *4* on the right, and *2* and *3* on the left of *D*. By joining each line in turn to the telephone *C*, these breaks and their bearings may be discovered; thus, by connecting to *4* it will be found possible to communicate with *A*, but not with *B*, and hence a break on this line between *D* and *B* is inferred.. Similarly it would be found that *2* is whole between *D* and *B*, but broken on the other side. By joining the whole portions of the lines *4* and *2*, or *1* and *3*, at the junction-box *D*, a continuous line between *A* and *B* is again established. Knowing the direction of the breaks, the lineman takes a favorable opportunity of repairing them, the repair being executed by laying bare the wires at the broken ends and tying them together by a reef knot, the bare part being then insulated with rubber tape or tubing. This method has the advantage that a break may be located, and that a broken line which causes a short circuit to earth may be disconnected until the broken part has been repaired.

When several telephones require to be kept in touch, an exchange is used. A battery commander may thus communicate with his observer, ammunition wagons, and guns, or any of these units with each other. A small portable exchange, provided with plugs or switches, is used in this and similar cases.

The office of field telephonist is one of great responsibility. He must be capable of keeping his instruments in order, and of executing ordinary repairs such as rewiring the parts. He must be capable of laying lines, detecting and locating breakages, and repairing them satisfactorily. He must also be able to transmit and receive messages by Morse code at a minimum rate of 12 words per minute. He is often compelled to act in an emergency, frequently at the risk of his life, in order to restore or keep up communication. His everyday duties demand knowledge, skill, and courage, and are important in the highest degree.

The training of a field telephonist cannot be accomplished by drill alone. He must, if he is to be thoroughly reliable, possess a knowledge of the working parts of his instrument, so as rapidly to detect and rectify a fault. And this leads to the suggestion that science teachers throughout the country might with advantage be used to impart this necessary knowledge in all localities where special instruction is not available. Such instruction should be carried out on an approved plan, and would require co-operation with the military authorities, in order that the actual instruments might be available for demonstration. By this means an abundance of reliable men could be secured in a short time, and with little expense.

Northwestern Increases Capital; to Spend Millions

Directors of the Northwestern Telephone Exchange Company have authorized an increase in the capital stock from $15,000,000 to $25,000,000 to cover additions and general improvements to their plants, which have become necessary owing to the company's growth. Minneapolis will be the principal beneficiary in the company's plans for improvement of its physical property.

"The money will be spent over a period of years," said M. L. Lane, commercial superintendent. "The improvements and additions have become imperative as the company, in its district comprising Minnesota and North and South Dakota, owns 157,957 stations and through its connections reaches 22,321 more. The directors' action gives us a free hand to keep pace with our growth."

In Minneapolis the company added 7,117 stations to its list last year, which represented a gain of 16 per cent, Mr. Lane said. During January 638 more were added. In the past 10 years in the Twin Cities the company has boosted its subscribers' list from 29,000 to 87,000.

Mr. Lane said the bulk of the money spent on improvements would naturally go to the Twin Cities where the company's largest plants are located. Minneapolis having the largest of the Twin Cities properties will therefore get the greater benefit.

Telephone Number on Note Paper Fad

The new fads in the social whirl, for the most part, make for convenience. The latest fancy is to have one's telephone number engraved on one's stationery. The monogram is out of date. The note, of course, opens at the left, just to make the reading of it as much of a Chinese puzzle as possible. Even our masculine friends have adopted this fashion. At the upper right hand corner is the owner's street address and town, and diagonally across the upper left hand corner is engraved the word "telephone" followed by the number. It is a helpful fad, inasmuch as even notes these days are apt to be answered over the telephone, and anything which saves time is as welcome as anything which spells novelty. The new fashion in stationery does both.

European Telephone Development

Translations from the Foreign Press and Communications from European Engineers

BY FRED W. SCHOLZ

THE present article treats the operation of low tension current systems, such as telephone exchanges from high tension wires. New devices are to be discussed which are suitable to enable telephone exchanges to take electrical energy also from an ordinary electric system such as the 220 volt systems used for street lighting. For the operation of exchanges primary batteries are often used, either wet cells or dry cells. The primary batteries have the advantage of reliability, independence and operating safety, but they are very uneconomical. The knowledge of this high cost of maintenance led electrical engineers to look for a cheaper source of power and it was natural that attention should be called to the street lighting and power circuits in a city or the high power transmission systems of hydro-electric and other plants. There are two ways of using the energy from a high tension system: either the electrical energy is used direct for the use of the low tension plant, or else the energy is stored up in storage batteries which then feed the apparatus. Both these possibilities will be discussed.

If the first method is used, we usually transfer energy from the high tension to the low tension system by having a link between the two. We have: 1. Inductive transfer by transformer coils; 2. Connection by use of condensers; 3, Use of balancing transformers; 4. Use of vacuum tubes.

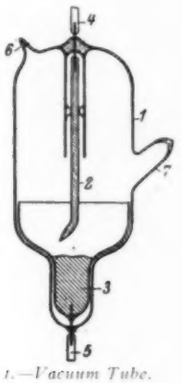


Fig. 1.—Vacuum Tube.

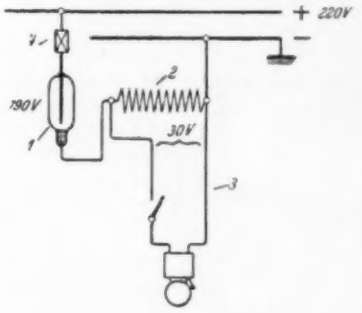


Fig. 2.—Basic Arrangement for Vacuum Tubes.

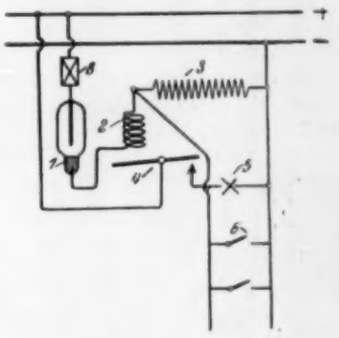


Fig. 3.—Uses of the Vacuum Tube.

The inductive transformation of alternating current is obtained by the use of reducing and step-down transformers. Such transformers reduce the current down to 4 to 8 volts for the use of the low tension lines, and are connected on the high tension side permanently to that system. These transformers work very economically and have been used in that capacity for many years, so that further explanation seems unnecessary.

In cities where a direct current is used, these step-down transformers are not feasible, and a type of automatic cut-out is used, which reduces the direct current in the city power system down to the desired voltage. These devices are very complex, however, and not suited for ordinary use and not in great favor.

For connection of condensers various points of view must be mentioned, depending upon whether direct or alternating current is used. The condenser stops direct current but not alternating current. Consequently the wiring must differ in either case. With direct current the condenser is connected alternately with the high tension and then with the low tension wires; it is charged at the former and discharged at the latter. If the connections change in rapid sequence through an automatic operating relay, then it is possible to operate the low tension apparatus without trouble by a series of discharge impulses of the condenser, which always obtains its charge from the high tension net. This type of apparatus lacks uniformity, however, for each individual case requires individual treatment.

In alternating current systems use is often made of a peculiarity of the condensers to pass a current which is dependent on the voltage, the capacity of the condensers and the frequency, but independent of the ohmic resistance of the circuit. The condenser acts as a sort of current regulator; it replaces the safety fuse and allows lamps of any voltage to be wired in series with the condensers, provided these are regulated for a maximum current equivalent to that of the condensers in question. On this basis low tension signal lamps, for example, have been fed from an alternating current net. Such devices require special safety cut-outs and fuses to prevent insulation disturbances and contact shocks. As a matter of fact, with a maximum current, if the condenser tension is zero, we experience the full high tension voltage at the ohmic resistance of the circuit, so that the dangers, leading to shocks and light arcs with insufficient insulation, become very real. The use of these condensers for feeding low tension plants from high tension alternating current systems is not feasible in most cases and only possible in exceptional ones.

Little need be said regarding the use of balancing transformers. According to the standards of the Electrical Association, this is not permitted, as there is to be no conductor connecting the high and low tension plant. It is of course permissible to connect one pole of the low tension plant to a grounded, bare third or neutral wire; a direct connection with the live feed wires of the high tension system must be avoided, however, under all circumstances, even though the wiring is such that the voltage at any open point of the low tension is no more than 30 volts. The danger of shock and accidents is here as great as in the previous case and the conclusion is obvious.

We now come to the new devices and apparatus,

which are to help solve the problem, especially for direct current systems. Many of these have been produced in practical form and have been used for some time; others are still on an experimental basis, though far enough advanced to merit wider knowledge. The class of apparatus now to be discussed is of the type of electric vacuum tubes and disruptive tubes. Under the name of vacuum lightning protectors such tubes are used in telephone and telegraph exchanges to protect the equipment against high tension from lightning or contact with a high tension feed wire. The vacuum arresters are so arranged that voltages up to 300 pass through the vacuum in the tubes to the grounded counter electrode and save the exchange apparatus from injury. There are vacuum tubes which are disrupted at 150 volts and less and consist of a negative electrode of alkaline metal, either potassium or sodium, and are filled with very rarified rare gas, like argon, neon, helium, under 1 to 3 mm. pressure. These rare gases are at present obtained very cheaply as by-products in the liquefaction industry. These discharge tubes are quite suitable for transformation of city power current to low tension plants, among them telephone exchanges. Of course it is necessary to connect one of the poles of the exchange to the bare neutral third wire, which, however, offers no thought of danger. If this is done, the vacuum tubes will give a means of reducing the higher tension current down to the proper tension, with a freedom of danger not met in some of the other systems.

If such a tube is placed between two conductors of perhaps 220 volts in series with a variable resistance, then with a sufficiently large series resistance there will occur a slight spark discharge, in which the current is low and the voltage at the terminals of the tubes very high. This is due to the fact that at the cathode alone, from 85 to 150 volts are used up. The discharge characteristic shows a rise of terminal voltage with the current strength.

VOLTAGE CURVE OF SPARK CURRENT.

Tube: Neon+Helium; gas pressure 3 mm; cathode of potassium.

Volt.		*Milliamperes.*
100		1.8
108		5.6
115		10.5
124		37.7
128		47.0
133		56.7
139		76.1
31	(light arc)	175.0

If the current strength passes a certain value, the cathode metal vaporizes at some spot and a light arc forms. The voltage consumption of the tube is low and the current strength rises in proportion. The current is conducted partly by the rare gas, partly by the cathode vapor and therefore the discharge changes in appearance. Tubes of the type usually found can pass current of 2 amperes and more continuously without trouble. We may sum up the above as follows: 1. As long as there is a spark discharge in the vacuum tube, it eats up most of the current in the feed wire. 2. According to the external resistance, the vacuum tube offers a very different resistance, which with spark discharge is very high, with light arc discharge is very low. Fig. 1 shows the most common form of vacuum tube; *1* is the vacuum vessel; *2* is an iron wire anode with ignition point *4*; *3* is the cathode made of some alkaline amalgam, which is introduced in a molten state; *4* and *5* are current conductors; *6* and *7* the points from the openings made for the purpose of filling and evacuating the tube.

Fig. 2 shows a fundamental arrangement for the use of such vacuum tubes. We may assume the vacuum tube *1* connected between the live wire of a 220 volt net and the neutral wire and then a series connected resistance *2*, which ends at the neutral wire, further the feed wires of a low tension plant *3* connected to the terminals of the resistance. If the tube is arranged properly by means of electrode distance, width of tube and gas pressure, so that with several amperes current flow it shows a terminal voltage of 190 volts, then the voltage along the resistance *2* will be 220—190 volts=30 volts. This voltage is also found at the terminals of the open low tension current plant, since this lies parallel to the resistance. Contact shocks are impossible. Insulation faults, which correspond to shunts of 50 amp. mm. at the terminals of the resistance, cannot cause the discharge of the light arc, and decrease, as the above table of spark discharges shows, the voltage which reacts parallel to the low tension system. Direct, non-resistance short circuiting at the terminals of the low tension plant would of course cause a powerful arc in the tube, but the use of a safety fuse or cut-out *4* (Fig. 2) would cause this to melt at once and the low tension plant would not be injured by any dangerous voltage.

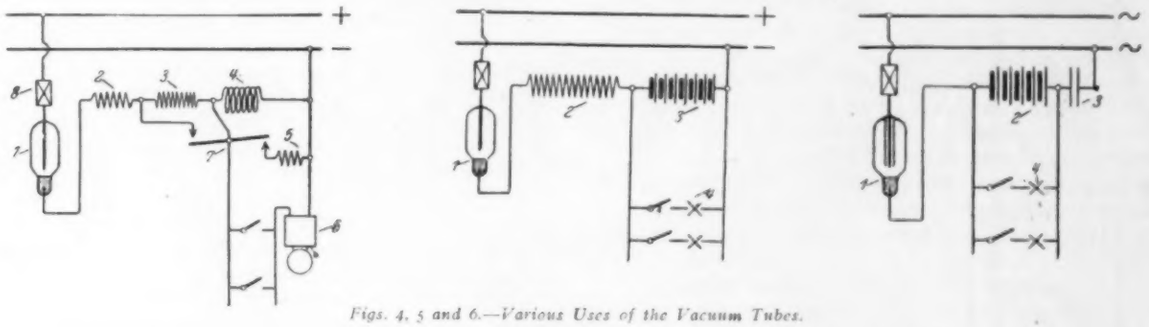
We come now to the practical application of these vacuum tubes. Fig. 3 shows an arrangement which permits a signal lamp or any other low tension apparatus to be connected from any point by using the high tension current to make the connection, while the current conductors to the various parts of apparatus are wired according to low tension principles. A vacuum tube *1* is connected in series with a high ohmic relay *2* and a resistance *3* between the high tension current conductors, whose negative one is considered as a grounded neutral wire. The low tension system is connected by switches *6* in shunt to the resistance *3*. The resistance of circuit and the tube are so regulated, that at the terminals of *3* there cannot be more than 30 volts difference. Closing of switch *6* short circuits resistance *3*, and the current in the relay coils is strengthened, so that the armature *4* is attracted and therefore the lamp *5* lights up. The spark discharge which is permanently in the tube does not cause any occlusion of the rare gases and can pass through the tube year in and year out. When the low tension contact *6* is closed, the increase of current is noted by the brighter light of the spark discharges; at the same time the relay works and connects the lamp. Any number of pressure contacts can be arranged at any distances and the wires may be the ordinary low tension ones.

Fig. 4 shows an arrangement for use of telephone bell circuits or any other bell circuit. The resistances *2* and *3*, also the high ohmic relay *4*, are in series with tube *1*. The current excites the relay, which therefore attracts the armature *7* and holds it. If the bell *6* is connected by closing the circuit of the low tension circuit, then the resistances *3* and *4* are practically short circuited, the relay armature falls away and connects the resistance *5* parallel to the low tension plant. The discharge current strength is in the main determined by the magnitude of resistance *2*. This is chosen small enough to obtain a light arc discharge in the vacuum tube and therefore the required operating current strength. The cut-out *8* serves to protect the exchange in case of a direct short circuit. If there is no more contact in the exchange circuit then the tension on the relay coil side rises, until the armature *7* is drawn up to the rest position, the light arc discharge in the tube ceases and there exists now a state of spark discharge in the tube of 2 to 3 amp. min., which would correspond for 220 volts, to a consumption of 0.44 to 0.66 watt.

Fig. 5 shows an arrangement for continuous charging of batteries, from d.c. systems. Such wiring and

arrangements have become important, since it has been recognized that secondary batteries are excellent for feeding of low tension plants, on account of their constancy of voltage, their high load capacity and low internal resistance. In order to avoid the trouble of watching charging of batteries, the storage batteries are placed in series with a high resistance, parallel to the direct current system, and the branches of the low tension wires at the terminals of the battery. The continuous current, whose strength for small cells is only a few milliamperes, keeps the battery permanently charged and is too low to overcharge it. To prevent abnormal tensions in the low tension wires in case of contact faults in the storage battery, a vacuum tube *1* is placed in series with the resistance *2*. If the tube then eats up most of the direct current, it is impossible for high tension currents to appear within the circuit of the low tension plant *4* even though the contact within the battery *3* should have been destroyed by accident.

Fig. 6 finally shows an arrangement whereby storage batteries can be charged from alternating current wires. The tube *1* then works like a current rectifier. To increase this effect, the anode is surrounded with an insulating tube, which prevents the production of cathodic spark layers at this electrode. A narrowing of the tube near the anode is sufficient, however, to choke off the half period of a.c. The effect with even very primitive arrangements is as high as 40 per cent. In Fig. 6 the battery *2* to be used for feeding the direct current apparatus *4* is placed in series with a condenser *3*. In a model arrangement five small lead storage batteries were connected to a vacuum tube and a resistance of 200 ohms in series with the a.c. wires of 120 volts. With the resistance used, the effective current in the circuit was about 30 amp.-min. and the current (d.c.) which fed the battery about 12 amp.-min. The arrangement worked without trouble, uninfluenced by the fact that current was taken from the batteries from time to time.—Dr. F. Schröter, *Elektrotech. Zeit.*



Figs. 4, 5 and 6.—Various Uses of the Vacuum Tubes.

SMALL BELT CONVEYOR FOR TELEPHONE WORK.

At the Breslau telephone exchange the call tickets up to a short time ago were collected from time to time or else handed down the line of operators at stated times. This proved to be a nuisance in the long run and the following substitute was found to give excellent results. There are six exchange tables and a 30 feet long and 6 inches wide endless jute belt was run over rollers some 8 inches wide and 3 inches diameter. The rollers run on ball bearings. The belt runs past the tables on top and returns below the tables. The belt is driven by a d.c. motor of 220 volts, 0.07 kw. capacity making 1200 r.p.m. Through a translation ratio of 1:18 between motor shaft and fly wheel of the driving shaft and an electric lamp placed in series with the motor winding, a belt speed of 1.7 feet per second is reached. The belt is exposed to varying weather conditions and is therefore liable to expand and contract and is run over a special spanner roll which keeps it always at a uniform tension. The belt runs along the top of the tables, where it is faced on either side by low wooden ridges, which serve both to keep the call tickets on the belt and also prevent the operator from being disturbed by the sight of the continuously moving belt. The device has been used with success for a number of months.—T. I. Harder, *Telegr. u. Fernsprech Tech.*

FRENCH FIELD TELEPHONES.

Very little is known of the details of construction of the field telephone instruments that are being used to an enormous extent in the present war. Of the French army telephones two types are here described, one evidently used in fortresses for short distance communication and the other one for general field use. In the former the microphone consists of a magnet, whose pole shoes are mounted on a brass plate and are surrounded by a wire coil. The pole shoes are soft iron cores, which receive their magnetism from two horseshoe magnets, which are clamped back of the brass plate on a lead plate. The diaphragm is a simple telephone sheet metal diaphragm. The receivers, somewhat smaller than the usual type, are built on similar lines. Operation goes on without any battery, only using the induction currents produced by the oscillations of the microphone plate. The result is that communication over large distances is practically impossible. Moreover, with the primitiveness of the apparatus, it is impossible to adjust it to any detailed extent. As these instruments were found in French fortresses it seems that they are to be used only for fortification service, where the distances are not great.

A second type of apparatus of better construction is in shape of a wooden box which is divided into two parts by a wooden partition. The upper third of the box is taken up during transportation by the receiver, the switch, the two conducting cords and the head receiver and transmitter. The lower section of the case has the necessary portions for a telephone instrument. The condenser is to prevent direct currents from entering the telephone. This is partly for lines where telephoning and telegraphing are carried on simultaneously on the same wires. The microphone in this telephone is made up of a thicker carbon plate in the rear and a thinner one in the front with carbon grains between. The wooden casing is of very thin wood, but is enclosed in a leather carrying case which makes it strong enough for field service. It is very practical, which is also shown by the fact that the battery is fastened to the leather case and is always connected with the instruments. The only disad-

vantage lies in the apparent necessity of using a double line, which is a great disadvantage for rapid stretching and taking down of lines. However, the apparatus works even with one line, provided the other one is grounded. If this is done, the call bell of the bearer's apparatus will sound, which is undesirable both for reasons of communication and for military reasons.

TELEPHONE TRAFFIC EFFICIENCY.

The full title of the dissertation given here in abstract form is: "The adaptation of telephone systems to changing traffic conditions." It has, however, been abbreviated to the above title and will be given in various installments, as it is too long for one issue. The subject was thoroughly and carefully investigated by Dr. Lubberger at the Karlsruhe technical school and takes up the subject in great detail. He takes up numerous topics, such as the variation in traffic as a function of the number of subscribers and of calls, and under this head he groups the influence of rates and the approach towards a method to balance and equalize errors in computation of traffic conditions. He then discusses the theory of variation in direction of traffic calls, giving the general equations, and the necessary subdivision of trunk lines into groups. Finally he considers the simultaneous traffic at various times, giving statistics gathered, tables and drawing conclusions.

It is not usual at the present time to give a degree of capacity or one of efficiency for telephone systems. We use general numbers, such as saying that 20 per cent of all calls are answered in three seconds, 50 per cent are answered in four seconds, etc. These figures depend mainly on the discipline in the exchange. The figures as to the speed of answering do not define the value of the telephone service, however. The calling subscriber does not care particularly how soon he is answered, but whether he receives the desired number or not. If we try to compare two systems, as manual and automatic systems, we find that all standards of measurement are lacking. We may say in general that a call in the automatic system is finished within six seconds, and one in the manual system within nine seconds. That does not say, however, how many calls were answered and how many words were left incomplete. The decisive influence on the point of sending through a call or not, is always the number of connections at disposal in the telephone system. In manual operation we must include in this equipment the operators, the cords and connecting lines, and in automatic operation the selectors and connecting lines, and in semi-automatic systems the selectors, operators and subscribers' lines. If any of these items is provided in insufficient numbers the entire system is impeded in its efficiency and the traffic in the long run will become bad. The present work tries to establish a relation between the connection of number of calls and the number of possible connections, and also their influence on the efficiency of good service. Late years have seen much valuable theoretic and empirical work done in this line, which has been used as far as possible in the present discussion.

If telephone traffic were entirely even, a system could be built in such a way, that every call could be passed either busy or free within a definite time. The frequency of "busy" conditions of a line is of no value for the operating efficiency of an exchange. The exchange has done its full duty if it has formed a connection with a free subscriber or has notified the subscriber that the desired line is busy. It is true that very busy lines have been found to be busy 30 per cent of the time that other subscribers called for them. That, however, is a question of rates and deals with the subscriber rather than with the exchange, for the subscriber should obtain more trunk lines in order to meet his greater business. The phenomena which are connected with too frequent busy line conditions will not be considered in this work, as these conditions relate to the working of the exchange only up to the time of testing a subscriber's line.

In the common manual-operation systems the average operator working at a multiple switchboard, without handing calls on to a second operator, connects about 240 calls per hour. If we assume an exchange where within one hour 7200 equally distributed calls are received, and if the time of conversation is 2 minutes on the average, we would need 7200:240=30 operators. A complete set of equipment could connect 60:2=30 calls per hour and we would need 7200:30=240 pairs of cords, or 8 pairs of cords per operator. In actual practice, however, telephone traffic is subject to great changes and variations and the question is, how the variations run and how the various systems adapt themselves to these changes. Here we will find that the magnitude of variations for automatic and semi-automatic systems will have to be found by actual computations, which was not done up to the present time in great detail.

Every exchange has times of high traffic. Usually the days immediately preceding Christmas are a time of great strain on the equipment. Usually the service on Sundays and holidays is smaller than on weekdays. During the night traffic is always less than during the day and during the day there are always hours with peak load in traffic. The position of these peak traffic hours depends on the needs of the subscribers and cannot be decided theoretically. Even during the peak load hours the traffic varies, the simultaneous calls varying in number to a greater or less degree. An exchange must be properly equipped for simultaneous calls; for it is a criterion for the success of a call, that at the time a call comes in, there is also a free line for connection. If all the available trunks are connected when a new call comes in, the system is that much short of good service. The above named variations in simultaneous calls during the year, day and hour may be called variations in traffic numbers. They refer to the calls received at the exchange from subscribers. Another type of variation refers to the calls which go out from the exchange to the subscribers. Let us assume an exchange with 10,000 subscribers connections. It can easily happen that the total traffic within two hours, say from 10 to 11 and from 3 to 4 o'clock, is equally great. From 10 to 11 the calls go mainly to one point, as for example, the stock exchanges, while from 3 to 4 the calls go from customers to banks or offices. In other words, the traffic going out from the exchange is not distributed equally over the various directions, but is subject to variations in direction. How have manual systems adapted themselves to these variations?

First of all, we must remember that in a manual exchange as many connections are placed at each operator's place as she can master within a given space of time. The position is also provided with as many pairs of cords as are equal to the number of simultaneous calls at any one period. Often constructive details will give the deciding voice for the number of possible calls per operator, especially if an older magneto system with drops is used, which take much space. A special compu-

tation of the equipment per operator is not needed, as experience has been long enough to make this unnecessary. Usually a place has 15 to 18 pairs of cords, and the number of answering jacks is in proportion with the traffic to be expected. Recent exchanges have as many as 120 or 200 call signals. These assumptions do not always meet actual needs, however, and at the beginning one is usually forced to shift connections from one operator's place to another until the requirement of proportioning the calls per operator has been fulfilled. For this purpose the intermediate distributing board is used. The subscriber's line is connected with the same number multiple line and a branch runs over the multiple board and the distributor to the answering jack. The latter of course has no number, as the operator can use any one of her set to answer a call. At the distributing board the calls are switched to any desirable answering cord, until the load on the operators has been equalized as much as possible. Periodic observations will usually give lack of uniformity of load after a certain time so that a redistribution becomes necessary. This intermediate distributer can take care of slow variations; sudden ones demand other remedies.

If there is a high tide of calls coming in, the time of waiting per subscriber lengthens. Instead of waiting 4 seconds for an answer, he has to wait 10 to 12 seconds or more. This makes the service poor, but does not stop it as yet. In a rush at one operator's position, the neighboring positions may not be so busy and can relieve the pressure by taking care of some of the extra calls. If the neighboring operators are also busy, the supervisors controlling the calls back of the operators can have calls switched to more distant boards. In other words, in manual operation it is possible to equalize traffic conditions without very much trouble. If all of the operators are rushed at the same time, which is fortunately the case only at times of public excitement or catastrophes, it is of course impossible to meet the demand, and subscribers will simply have to wait a longer period of time. The above system of aiding rushed operators is not sufficient, however. Often subscribers' lines are connected to several signal lamps of various colors, usually white and green lamps. The green lamps are placed at positions with little traffic or new positions and when the rush is greatest, the very busy calls are switched to these green lights and operators ordered to answer the green calls, whereby the ordinary white call operators are relieved.

Another means of aid is the so-called Copenhagen system. Every operator has several jacks which are connected with selectors. The selector contacts lead to answering jacks at other operators' places. If an operator is rushed with calls she connects several of the surplus calls with the selectors, which latter automatically find a free operator. These helps might also be termed loan or exchange systems. In the distributing system, the operator receiving the call gives the call immediately to some free operator who has a pair of free cords. The first operator knows this from the signal lamps at her switchboard. Here variations in traffic can be met by distributing calls over the entire staff. Of course the distributing operators might be rushed, but as the equipment for them is very simple, it is easy to provide enough cords and connections to meet all needs. The best known European plant of that kind is the Hamburg exchange.

We come now to the automatic system, where human intelligence is superseded by mechanical operation. The basis of comparison will be the Strowger system, which is too well known to need further description. The question is, how the various groups are interrelated as regards variations in calls and directions of calls. It is clear that the selectors and connecting lines of the different groups cannot relieve each other. One is therefore obliged to provide enough connections at the beginning in order to allow for this condition. But suppose a group is overloaded, can aid be given by a longer time of waiting? In the present systems this is not possible. The subscriber lifts his receiver and turns his disc without caring or knowing what is going on at the exchange. He should always be able to get an open line for his call; if this is not the case at the time when he calls, he cannot even get the central trunk and his call is a failure. There are systems where waiting times have been introduced. Here an electromagnet has been provided in the subscriber's instrument, and the subscriber can turn his dial, but the latter will return and give current impulses only when the electromagnet releases it. The magnet, however, is excited from the exchange, after the connection with the first group selector system has been made. There is a small exchange in Canada which works in this way. The reason why this system has not been introduced more is the unsuitability of the electromagnet at the subscriber's station. The electromagnet must be built very strong and the locking system must be powerful, as the subscribers often misuse the apparatus, thinking that it is out of order. The cost of equipment is very much increased and the repair costs would rise too high to make it feasible to introduce electromagnetic locking and releasing more generally. For calls coming in at the automatic exchange, the conditions are about the same as those for the distributing board in the manual system, but in the outgoing calls there is a possibility of a piling up of calls, as there is no possibility of switching the service over to less busy lines. Where the small groups of ten are used, it is easily conceivable that there might be a rush which the small group system cannot meet. The obvious remedy is to enlarge the unit group from ten to double that number and thus improve the efficiency by 50 per cent.

In computing the efficiency of the automatic system we must always take recourse to Campbell's formula: $V=CT+2.8\sqrt{CT}$, where V=the number of lines needed to meet C-number of calls with T-unit of time. For C=250 calls per hour and T=2 min.=0.033 hrs. we have: $V=250\text{x}0.033+2.8\sqrt{8.3}=14$, which is the number of connecting line units. If we assume that we are to build an exchange for 10,000 subscribers, making during a rush hour 16,000 calls with the average time of conversation of 2 minutes and using 20-part first selectors, we have from the formula: $20=C\text{x}0.033+2.8\sqrt{C\text{x}0.033}$; C=400. The twenty outlets of a preselector group can handle 400 calls during a rush hour, that is $\frac{16{,}000}{400}$=the 40th part of the total calls. We must not assume, however, that these 400 calls are made by $\frac{10{,}000}{40}$=250 subscribers. The traffic of 250 subscribers varies much more than that of 10,000 subscribers. The question is, how many subscribers may be united into one group. There are neither theoretical nor experimental data for the answer. There is also another point. Even, if we unite 250 subscribers into one group and use twenty-part pre-selectors, will the service not be worse than that covered by Campbell's formula?

The problem becomes worse if a system other than the Strowger is used. Frequent attempts have been made to build efficient 25-part selectors, rather than the very expensive 100-part selectors. But there are no data on hand, and to obtain experience by building an actual exchange and then changing it for experimental purposes is a little too expensive.

The following discussions will try to answer some of these problems, using the theory of probability for that solution. As a standard we may take that a subscriber calls an exchange and wants a number, regardless whether he is connected by an operator or makes his own connections. If among 400 calls, one call is lost on account of busy connecting lines, the service is good; if the ratio is one among twenty, it is poor. As a measurement for the efficiency of operation, we take the "probability of getting a call through." This magnitude must receive a mathematical definition, which may be done, when the following three problems have been solved:

1st Problem: If a large group of S subscribers makes C calls, then the small group of s subscribers makes c calls with the probability w. How large is w? (probability of variation of number of calls). Example: If 10,000 subscribers make 15,000 calls, then 100 subscribers make 50, 100, 150, 200, 300 calls with what probability w?

2d Problem: If a telephone system, in which S subscribers make C calls, is divided into groups of S_1, S_2, S_3..... subscribers, with what probability will s_1 calls come to group S_1, s_2 calls to S_2 group, etc.? (probability of variation of direction of calls). Example: If 10,000 subscribers make 15,000 calls and if the exchange is divided into 10-thousand groups, with what probability w will 500, 1000, 2500, 2000, 2500 calls come to the individual thousand-groups?

3d Problem: If in an exchange, S subscribers, who are divided into $S_1+S_2+S_3....=S$ groups, make C calls, and if the number s_1 calls flow to group S_1, for which purpose, v_e, connecting lines have been provided, with what probability w will a call go through? (probability to get a call through). Example: 10,000 subscribers are divided into 10 groups of 1000 connections each. Between every 2 thousand groups are 10 connecting lines. With what probability will a good connection be made, if 750, 1000, 1250, 1500 calls are to flow to the thousand group?

The first and second problems are here solved for the first time, the third one has been touched before and the material has been used in the discussion.—*(To be continued.)*

Postal Offers Cut in Telephone Rates

W. W. Morrison, local manager of the Postal Telegraph Company, St. Louis, Missouri, has announced that long-distance telephone service over the Postal wires between St. Louis and the principal cities of the South and Southwest has been opened.

The service is confined to big users of the long-distance telephone, notably lumber, grain, live stock and produce men. Conferences are being held, however, with officials of the Kinloch Telephone Company in an effort to bring about an arrangement under which subscribers to the Kinloch system may be reached by Postal long-distance calls.

A reduction in cost is promised. Mr. Morrison states that the rate of the Postal Company to Little Rock is $1.60 for the first three minutes. The Bell system charges $2. To Memphis the Bell rate is $1.75. The Postal rate is $1.50. The Kinloch has no connections of its own to these cities.

Arrangements have already been made with the Home Telephone Company of Cairo, Illinois, the Independent Telephone Company of Memphis, the Automatic Telephone Company of Dallas, and other Southern Independent companies for transmitting the Postal's long-distance messages. At present the long-distance service is confined to booths in the main office of the Postal Company and the Merchants' Exchange.

Pupin Says Static Has Been Overcome

The New York Electrical Society held a notable meeting at the Engineering Societies building, New York City, on January 27, when Michael I. Pupin spoke on "Wireless Transmission Problems." The audience numbered over 300.

The address was remarkable in many respects. Not only were various problems involved in the recent new triumphs in long-distance talk transmission analyzed and solved with a simplicity and clarity which delighted those who had the good fortune to be present, but Dr. Pupin stated that one of the greatest discoveries in history, the conquest of the menace and bugbear of all time—the static—was about to be given to the world, and he said that this discovery, which had cost him seven years of experimentation, not to mention the work of others, will make possible the transmission of messages by wireless telephone to every part of the world.

Ed Martin Has Hoodoo Date

January 29 is the hoodoo day of the Martin Telephone Company of Webster City, Iowa, of which E. H. Martin is president. Nine years ago upon that day occurred a terrific snow and sleet storm which hushed nearly every telephone wire of the city at a loss of $30,000 to the company. Every year since that date upon January 29 has occurred a sleet storm or the company has been experiencing the effects of a sleet storm averaging a yearly loss of $1,000 or more. This year on that date service was as usual crippled. Rural lines were almost put out of commission while toll lines suffered.

Ohio State Booming

The earnings of the Ohio State Telephone Company continue to make a fine showing and the common stock has been in great demand. Interests in the Ohio State Telephone Company are closely identified with the merger of the Independent telephone companies in Indiana, and it is reported that a close working agreement will be had between the two systems.

This is expected to enlarge the business of the Ohio State Company to a considerable extent.

Merger Case in Nebraska

Prospects for the merger of the Independent and Bell Telephone Companies in Kearney, Nebraska, are good at the present time. It has been officially announced that permission has been granted the Independent company to take over the Bell service, local and tributary. Such a merger was not originally intended, as the Bell decided to take over the Independent plant, but was refused permission to do so.

What's the Matter with the Business?

An Answer to Telephone Engineer's Editorial Last Month

BY TERRY W. ALLEN

IN handling a matter that concerns the integrity of any business, a certain amount of study is required to arrive at a safe and reasonably acceptable conclusion.

What's the matter with the telephone business? If I were to answer this in a single sentence, without thinking, I would say that there is nothing the matter with the telephone business.

If I were to stop and analyze for a moment the situation that has been created in the minds of Independent telephony, I would say that there is a whole lot the matter with the telephone business.

I do not think, though, that there is as much wrong with the telephone business as there is wrong with the men who compose the telephone business.

Terry W. Allen, President the Allen Properties, Corinth, Miss.

In the first place, the Independent telephone industry is not knitted together in a unified way. It is true that the Bell telephone companies are closely allied and work together, but the Independent interests, and those who are directly interested in Independent companies, are not united upon any of the great issues that are a part of that great industry.

In fact, half of the Independent operators look upon the other half as schemers, whose sole subject in life is to get them in some sort of trap, and close down upon them and put them out of business.

There is another group of Independent operators that will have no dealings with any of the Independent associations; in fact, they will deal with hardly any one for fear that they will be caught between some kind of mill-stones and ground to pieces.

A brilliant writer on Independent telephone subjects made a certain statement some time ago in one of the telephone magazines, the substance of which was this: "that a number of companies had made terms with the Bell system, and that the majority of other companies were only waiting for an opportunity to get into that self-same organization." If this condition be true, it very clearly and definitely answers the question as to what is the matter with the telephone business. It implies that the honesty of purpose of any Independent company is only held until peace can be made with the Bell telephone company.

It may be this kind of a "Will o' the wisp" that is alluring honest Independent telephone operators away from the Independent industry, and holding forth hope of some day being a part of the Bell system. If this is a true condition, the Independent telephone industry is very sick indeed.

The telephone industry of this country is divided into seven classes: the Bell companies, the straight Bell sub-licensees, the Independent Bell sub-licensees, the Independent companies, the mutual companies, the farmer lines, and the manufacturing companies. This, I think, pretty nearly describes the telephone field as we have it today. The first three named divisions compose the eight million five hundred thousand Bell stations, and the second three divisions compose the five million Independent stations in this country. The last named division is composed of *all* the manufacturing interests in this country.

To my mind the Independent-Bell sub-licensee companies are causing all of the trouble to the telephone industry. In other words, it is this class of companies that have made their peace with the Bell; these companies are holding out to the other Independent companies the false hope that some day they, too, may be a part of the Bell system. It is this section of the Independent industry that is causing all of the dissatisfaction and distrust among the real Independents. It is this class of company that is causing the simon-pure Independent companies to come to the conclusion that the only object these Bell-Independent companies have is to break down their strength and spread dissatisfaction in their ranks.

Another great trouble with the Independent telephone industry is the fact that its manufacturers are as deeply jealous of each other as they are of their great competitor. Numbers and numbers of instances have come to light where the Independent manufacturers, when they couldn't land a job, would throw their weight to the Western Electric Company, the great competitor of all Independent telephony, to help that company land the job!

One of the greatest needs that is felt in the Independent industry is the need of an Independent Telephone Manufacturers' Association.

The telephone industry is all right, but the views of a number of men that compose about half of the Independent telephone industry are all wrong, and until thorough means of intelligent co-operation is brought about, these doubts cannot be removed from the minds of numbers of Independent operators, and a condition of stability cannot be hoped for under these conditions, nor can the telephone industry hope to make the progress that it is justly and honestly entitled to.

As the fourth ranking industry in the United States, the telephone industry shows but a pitiful amount of publicity, and the only national telephone publicity that is shown is that of the Bell companies.

The remedy is obvious. The Independent-Bell sub-licensees should have a minor, not the principal part in the Independent telephone industry, and an honest attempt should be made to enforce the anti-trust laws against the encroachments that have been made in the last few years.

Until this is accomplished the telephone industry cannot hope to accomplish the great good and purpose that it is capable of accomplishing.

The Kansas Convention

The twentieth annual convention of the Kansas Independent Telephone Association was held February 15, 16 and 17 at the National hotel, Topeka. A large delegation was greeted by Mayor Jay E. House, and J. D. Waters of Bonner Springs responded in behalf of the association.

John M. Kinkel, of the Public Utilities Commission, spoke on the "Advantage of Public Utilities," and a few remarks were made by President T. L. Youmans. After receiving the reports of committees and other routine work the board meeting adjourned. The Wednesday morning session was addressed by Senator J. D. Joseph, of Whitewater. H. A. White, of Kansas City, Mo., gave a practical demonstration on how to locate trouble in coils and bad joints. An operators' school held at the afternoon session was a feature of the convention. It was presided over by Mrs. Alice Douglas of Emporia, and H. W. Gwillim, traffic manager, of Kansas City, Mo. Operators from all parts of the state were present and Mrs. Douglas in her address urged telephone managers to insist upon politeness to subscribers. A banquet at the Commercial Club rooms closed the Wednesday session.

At the Thursday session addresses were made by E. H. Hogueland, of Topeka, and F. B. MacKinnon, of Washington, D. C., third vice president of the United States Independent Telephone Association.

The entire seventh floor was given over to exhibits. The S-R Electric Company of Chicago exhibited its S-R Private Service System for use on local battery instrument party lines. This room was continually filled with interested telephone men, and the Topeka *State Journal* in relating the conference said it was one of the most interesting exhibits at the convention. A Kansas telephone company purchased two S-R Private Service telephone instruments from the exhibition circuit used at the convention to demonstrate.

T. L. Youmans of Osawatomie was re-elected president of the association, J. D. Waters of Bonner Springs vice-president, and J. H. Close of Topeka re-elected secretary and treasurer. The executive committee are as follows: G. M. Stratton, Clay Center; B. W. Wiltrout, Logan; C. J. Meyers, Kansas City; C. H. Parker, Eldora; C. A. Sloan, Pratt; W. P. Hemphill, Ottawa, and A. J. Stevens, Hiawatha. This was the closing of one of the most successful conventions ever held by the association.

Tri-State Fighting for Connection

The Tri-State Telephone & Telegraph Company at Owatonna, Minnesota, will be compelled to fight their own battle with the Northwestern Telephone Exchange Company as the result of the conference held between the representatives of both companies and the aldermen with the avowed purpose of reaching an agreement over the physical connection between the Northwestern exchange and the Tri-State long distance lines.

The proposition of the Northwestern Telephone Exchange Company agreeing to a physical connection with the exchange upon the payment of five cents for each incoming and outgoing message sent over the lines on the Tri-State Telephone & Telegraph Company and in addition ten cents to be considered a differential and shall be paid to the Northwestern Company, and further a stipulation that the Tri-State Company is not under any circumstances to absorb the differential from its own revenue, was read and after a discussion of the question at length C. B. Randall, secretary of the Tri-State Telephone & Telegraph Company, was compelled to state that the Tri-State Company would not agree to the proposition.

He objected to the payment of the different fee which he held unreasonable and unjust.

As no agreement was secured the city has since prepared a petition to the Railway and Warehouse Commission to take this matter up and have the differences adjusted.

Refuses to Enjoin Automatic Sale

Judge Windes has refused to grant a temporary injunction restraining the city of Chicago from approving the sale of the automatic telephone system to the Chicago Telephone Company for $6,300,000, holding that the allegation in the bill of John Fitzpatrick, president of the Chicago Federation of Labor, that the city was to receive only $500,000, a sum deemed insufficient for its rights, was not enough to warrant issuance of a writ.

It was contended by Attorney Charles P. Schwartz, representing Fitzpatrick, that the sale would tend to create a monopoly and that telephone rates would be raised as a result.

When asked by the court whether any charges of fraud against Mayor Thompson and the council were made in the bill, Attorney Schwartz said:

"None except that of legal fraud. We claim that a fraud exists in the discrepancy between the $500,000 it is proposed to pay the city and the amount the city actually is entitled to."

"Under those circumstances," said the judge, "I think I will deny the motion on the assumption that the mayor and the council will do the square thing."

The case was continued until March 6 for further argument.

Threaten a New Company

As the result of refusal of the patrons of the farmers' lines connected with the Modeso telephone exchange, California, to pay an increase in rates from $7.20 to $8.40 a year and a determination to stay by the refusal, the Pacific Telephone and Telegraph Company may lose 800 rural subscribers. Plans for active refusal were made at a meeting of patrons which culminated in a strong sentiment for the establishment of an independent exchange to handle all rural business. Allen Talbot was elected chairman of the meeting and I. L. Dienstag secretary.

Iowa Companies Have Perpetual Franchise

The Supreme Court has decided that the Chariton Telephone Company of Chariton, Iowa, has a perpetual right to the use of the streets and alleys under rights granted it by the state prior to 1897. Suit was brought by Chariton citizens some time ago to determine the right of the Chariton Company to use the streets and alleys and the Supreme Court came to the above decision.

Eight seconds is the maximum time which an operator of the Chicago Telephone Company can sound the busy signal buzzer in the subscriber's ear, when a number is called and the operator wishes to indicate that the telephone called is in use. This is a telephone company announcement.

MINNESOTA TELEPHONE NEWS

BY THE MINNESOTA INDEPENDENT TELEPHONE ASSOCIATION
326 McKnight Bldg., Minneapolis, Minn.

AN ADDRESS ON ACCOUNTING GIVEN BY H. B. WARREN, STATISTICIAN OF THE MINNESOTA RAILROAD & WAREHOUSE COMMISSION AT THE ANNUAL CONVENTION OF THE M. I. T. A., JANUARY 26, 1916.

THE telephone law of the state of Minnesota requires that the commission be furnished with a report each year of the operations and financial condition of all telephone companies operating within the state. The commission having not yet completed its annual report form for telephone utilities, it was suggested that I outline to you briefly the information which it will be necessary for the telephone companies to furnish in the report to the commission. It is not my intention to set before you a system of accounting.

In addressing you on this topic, I have no reference to Class A and B companies, which for the present will be permitted to report according to the classifications, as required by the Interstate Commerce Commission. My remarks will be directed to Class C and D companies, those having revenues less than $50,000 a year. It is desired to make a form of annual report for these companies as simple as possible, in order to make the work not too onerous for the reporting companies.

We will require a statement of the plant and property account, a balance sheet, and a detailed statement of the revenues and expenses. The plant and property account should be subdivided to show the cost of land, buildings and fixtures, central office equipment, wire plant construction and equipment, subscribers' station equipment, general office equipment, etc. In this connection, it is probable that in many instances such costs cannot be obtained, but they should be estimated and the basis for the estimate submitted to the commission.

Any property owned, but not used in the operation of a telephone system, should be so designated. When any increase is made to the plant account, or any portion abandoned, a detailed statement should be furnished, showing the changes made, according to the classification above outlined. The commission will later issue instructions as to just how these changes should be handled on the books.

The balance sheet should show the cost of the plant and other property, the current assets, capital stock, funded debt, current liabilities, reserve accounts and profit and loss balance. The current assets consist of cash, notes and bills, accounts, interest and dividends receivable, materials and supplies, and any other assets which it is expected will be immediately receivable.

The capital stock should be subdivided as between common and preferred, showing the amount of issue authorized, the amount actually issued, any withdrawals from the issue and the amount actually outstanding in the hands of the public. The funded debt should be subdivided, according to the nature of the bond issued, showing the same information as required for the capital stock. The current liabilities will consist of notes, bills and accounts payable, interest on funded debt due, but not yet paid, and similar items. The reserves should be classified, according to their nature.

The operating revenues are of three kinds, exchange, toll and miscellaneous, and care must be taken not to conflict the classifications. We will endeavor to issue minute instructions covering all the possible charges and credits to these revenue accounts, explaining in full which are exchange revenues and which are toll revenues. The exchange revenues will be sub-classified into revenues from subscribers, revenues from switching and miscellaneous. The subscribers' revenue should include, not the amount of cash collected, as seems to be the impression in some places, but the amount of earnings accruing to the company from its subscribers, local, rural, private branch exchange, extension sets, extension bells, public pay stations, etc., whether collected or not.

The switching exchange revenue should include the commissions for switching from and to farmer lines. The miscellaneous exchange revenue will include pin and pole rental and any other rentals accruing within any exchange area for pole attachments, etc. The toll revenue will include all revenues and commissions accruing to the company for toll calls and connections. The miscellaneous revenues will include messenger fees, revenues for advertising in directory, for special inserts in directory and numerous other items, all of which will be fully explained in the text of the report to be furnished by the commission.

The operating expenses are classified as maintenance expenses, operation expenses and general expenses, with subdivisions under each head. It is advisable to separate labor from material charges, and due provision will be made for such separation. The maintenance expense will include material used for repairs to cable and wire plant; to equipment, the expense of station removals and changes; wages of repairmen; depreciation of plant and equipment, and other expenses. The operating expenses will include the wages of operators, the cost of power, the cost of batteries, expense of messengers, etc. The general expenses will include the salaries of the managers and officers, stationery and printing, office expense and supplies, insurance, light, heat and rent, advertising, expense of directory, etc. It will also be necessary to report any income or deductions from income, such as dividends on securities, interest on bonds and notes receivable or interest paid on borrowed money or on funded debt.

This covers, in a general way, the financial condition, but in addition thereto, there will be other information required. We shall want the full nature of the service and business conducted, and the extent of the territory served and competition existing within the territory, a list of the officers and directors of the company, the number of subscribers, classified as between business and residence, stockholders and non-stockholders, one-party, two-party, three-party, private branch exchange, etc., the number of central offices and the character of the switchboard in each central office, whether central energy, magneto, automatic, etc. The number of lines connected at each switchboard; the ultimate capacity in number of lines of each switchboard; the number of operators; the number of calls received daily, according to the last peg count taken; the classification of the circuits, whether they are metallic, common return or grounded wire; the number of miles of pole line; the number of miles of iron wire and copper wire, and the number of feet of cable.

It must be understood that I am not necessarily

covering the entire ground, but endeavoring only to outline the necessary information for the commission to maintain an intelligent record of each and every telephone company within the state. It is our desire to burden the telephone companies as little as possible, and to that end, we invite suggestions and earnestly desire hearty co-operation.

IN THE MATTER OF THE APPLICATION OF THE NORTHWESTERN TELEPHONE EXCHANGE COMPANY FOR PERMISSION TO PURCHASE THE TELEPHONE PROPERTY OF MR. A. FITCH OF ST. PAUL PARK.

Application having been filed by the Northwestern Telephone Exchange Company asking for permission to purchase the telephone property of A. Fitch of St. Paul Park, Minnesota, alleging that Mr. Fitch is willing to sell to the petitioner and that the public interests will be benefited by such transaction, notice was given that a hearing upon such application would be held before the commission at its offices in the State Capitol, Tuesday, February 15, at 10 A. M.

This application was duly heard by the commission, E. A. Prendergast, general counsel, and M. L. Lane, division commercial superintendent, appearing for the petitioner, and A. Fitch appearing in his own behalf.

From the evidence, it appears that the Northwestern Telephone Exchange Company is a corporation, duly organized and existing under and by virtue of the laws of the state of Minnesota and engaged in the conduct of a general telephone business in this and other states; that A. Fitch is the sole owner of the local telephone exchange in St. Paul Park, Minnesota, and as such has operated it for the past eight years; that in the operation of such exchange he has leased from the petitioner all the central office equipment and subscribers' station equipment necessary to the operation of said exchange, and also the right to attach wires to the poles of said petitioner. The evidence further shows there are approximately forty local subscribers connected with the exchange, and that there are thirty-five rural subscribers receiving exchange service over connecting rural lines. It also appears that the respondent is unable to make the necessary extensions of his plant in order to provide adequate telephone service for the community which he serves, nor is he able to keep the exchange in good repair so as to enable him to give a good and continuous telephone service, and that the desire to sell the exchange to the petitioner is entirely voluntary on his part; that the Northwestern Telephone Exchange Company has agreed to purchase the telephone property of A. Fitch for $300; that it will reconstruct the exchange, expand and improve the business, and thus give better service to the subscribers than they now enjoy.

It is therefore ordered that the Northwestern Telephone Exchange Company be permitted to purchase the property, capital stock, bonds and other obligations of A. Fitch of St. Paul Park, Minnesota.

COUNTY MAPS FOR PLATTING RURAL AND TOLL LINES.

The Association now has on file at its office in Minneapolis, copies of the 59 Minnesota county maps issued by the government. These maps are kept for reference and in making up records, also for members of the Association who may call at the office seeking information along that line.

Every telephone company, whether large or small, should have a map record of its outside plant and where rural or toll lines are part of the system these government maps are just what is needed to show the construction and location of stations. The maps are printed on heavy white paper and called "blue line prints," drawn to a scale of one inch to the mile, and in addition to showing the cities, villages and highways, the government has spotted or located all farm houses, schools, churches and rural delivery routes in detail.

There is no county map published more suitable for use in the telephone office than these maps. The cost is nominal and as the Railroad and Warehouse Commission, when calling for the 1915 report, will probably include that the telephone company file a plat showing the local and rural lines owned, it might be advisable to get two maps of each county in which the company operates.

There are different ways in which to show the rural lines and stations on the maps to be filed or kept for record by the company and the executive agent will be very glad to assist in making up a record of this kind that will be simple in form, easy to understand and suitable for the commission's report as well as for the files of the company.

Following is a list of the maps that are issued at this time, and one or more may be obtained by remitting 25 cents in stamps, or otherwise, for each county desired, to the executive agent, who will have them sent direct to the company from Washington:

Counties—Anoka, Becker, Benton, Bigstone, Blue Earth, Brown, Carver, Chippewa, Chisago, Clay, Cottonwood, Dakota, Dodge, Douglas, Faribault, Fillmore, Goodhue, Grant, Hennepin, Houston, Isanti, Jackson, Kandiyohi, Lac Qui Parle, Lesueur, Lyon, McLeod, Martin, Meeker, Morrison, Mower, Murray, Nicollet, Nobles, Olmsted, Ottertail, Pipestone, Pope, Ramsey, Redwood, Renville, Rice, Rock, Scott, Sherburne, Sibley, Stearns, Steele, Stevens, Swift, Todd, Traverse, Wabasha, Waseca, Washington, Watonwan, Winona, Wright, Yellow Medicine.

HEARING TO DETERMINE A REASONABLE FEE FOR ORIGINATING AND TERMINATING TOLL MESSAGES.

A hearing was held before the commission at the Capitol building, St. Paul, at 10 a. m., February 8, in the matter of the Fulda Telephone Company and the Northwestern Telephone Exchange Company, relative to determining a reasonable fee to be paid the local company by the toll company for handling its long distance business.

F. D. Lindquist represented the Fulda Telephone Company, assisted by J. A. Cashel of Worthington Telephone Company and Frank Kalash of the Lakefield Telephone Company. The Northwestern Telephone Exchange Company was represented by G. H. Pratt, general commercial superintendent; M. L. Lane, division commercial superintendent, and E. A. Prendergast, attorney. C. B. Randall, secretary and attorney, represented the Tri-State Telephone and Telegraph Company.

There was a large appearance of telephone men from different parts of the state and witnesses were called by both sides. C. F. Knapp, Sherburne County Rural Telephone Company, of Big Lake; William Balder, Melrose Telephone Exchange Company, of Melrose; Jay Greaves, McLeod County Telephone Company, of Glencoe; O. C. Sparstad, Sacred Heart Telephone Company, Sacred Heart, and H. F. Lueders, Norwood-Young America Telephone Company, of Norwood, each testified that in their opinion and without having detailed figures, a commission of five cents on each "in" and five cents on each "out" toll message was fair and reasonable insofar as their respective companies were concerned.

F. D. Lindquist of the Fulda Company, L. R.

Duxbury, Worthington Telephone Company, and Frank Kalash, of the Lakefield Company, testified that they did not consider this commission was compensatory at the exchanges they represented.

G. H. Pratt of the Northwestern Company testified that about 90 per cent of its exchange contracts were made on the five cents "in" and five cents "out" basis; also that this rate of commission was the highest paid anywhere in the country.

None of the companies represented produced any detailed figures or statistics in testimony and although the hearing was continued through the second day, the commission gave notice that if after reviewing the testimony offered it was found further evidence was necessary before deciding the case the parties interested would be notified accordingly.

HEARING IS UNEXPECTEDLY CALLED BY THE INTERSTATE COMMERCE COMMISSION AT WASHINGTON, RELATIVE TO PHYSICAL VALUATION OF RAILROADS. COMMISSIONER CHARLES ELMQUIST OF MINNESOTA, CHAIRMAN OF THE COMMITTEE REPRESENTING THE NATIONAL ASSOCIATION OF RAILROAD COMMISSIONERS ON HAND.

Arguments before the Interstate Commerce Commission relative to physical valuation of railroads made it impossible at the last minute for Commissioner Elmquist to address the recent convention of the Minnesota Independent Telephone Association.

Mr. Elmquist is chairman of the committee representing the National Association of Railroad Commissioners having this matter in hand and his presence in Washington was very necessary. He made the principal argument and it covered every possible angle in connection with the valuation of railroads. Pierce Butler of St. Paul represented the railroad companies.

This question of railroad valuation, it is said, involves a greater wealth than any case ever represented before the Interstate Commission or other tribunal in the world. Representatives present spoke in terms of billions as the telephone man would discuss his small purchases. The cost of reproduction as argued by Commissioner Elmquist and others is especially interesting to the telephone owner, now that telephone properties are under the supervision of these same commissions and will no doubt be valued by them in the near future.

ASSOCIATION NEWS ITEMS.

MCHUGH: The McHugh Telephone Company has just held its annual meeting and elected the following officers: President, Jake Johnson; vice-president, Ed. Erickson; secretary, J. C. Anderson.

DEERWOOD: At the recent annual meeting of the Hamlet and Shirt Lake Telephone Company the following officers were elected: President, Alfred Johnson; vice-president, Peter E. Nelson; treasurer, Paul Bergfalk.

DANVERS: The Danvers Rural Telephone Company has just held its annual meeting and elected the following officers: President, Theo. Torgelson; vice-president, Hans O. Borgon; secretary, C. J. Rykken.

PILLAGER (Crow Wing Valley): At the annual meeting of the Crow Wing Valley Telephone Company, held in January, the following officers were elected: President, C. E. McNeil; vice-president, John Scherling; secretary, P. A. Swedberg, Jr.

HOUSTON: The Peoples Telephone Exchange at its recent meeting increased the capital stock to $3,000 and elected the following officers: President, D. W. Robinson; vice-president S. B. McIntire; secretary, C. F. Schonlau.

DEERFIELD (R. F. D. Medford): The Deerfield Farmers Rural Telephone Company held its annual meeting the last of January and elected the following officers: President, Peter Yust; vice-president, J. B. Spindler; secretary and treasurer, E. C. Bredlow.

MADISON: The Madison Telephone Company at its recent annual meeting elected J. J. Little, president; O. A. Isaacson, vice-president; and J. R. Swann, treasurer.

ATWATER: The Harrison Union Telephone Company at its recent annual meeting elected the following officers: Olaus Anderson, president; S. M. Dahl, vice-president; and Edward Bredeson, secretary.

AITKIN: At the recent annual meeting of the Aitkin-Deerwood Telephone Company the following officers were elected: President, C. P. DeLaittre; vice-president, Mrs. Katie V. Hodgeden; secretary, F. E. Krecht.

BEAUDETTE: Charles Taylor of Pitt is promoting a rural telephone line to connect with the farmers along the river to Wabanica, Hackett and on to Pitt.

APPLETON: George Woods has recently resigned his position in charge of the local Bell exchange and is succeeded by Mr. Walker of St. Cloud.

SLEEPY EYE: The Sleepy Eye Rural Telephone Company at its recent annual meeting elected the following officers: President, C. P. Cutting; vice-president, Frank Romberg; secretary, William Brust.

RUTLAND (Fairment): At the recent annual meeting of the Rutland Telephone Company the following officers were elected: President, William Wolter; secretary and treasurer, George Plumhoff.

WEST RIVERSIDE (Cambridge): The West Riverside Telephone Company at its annual meeting held recently elected the following officers: President, Fred Forsberg; vice-president, A. B. Jarnell; secretary, Gust Erickson.

FORESTON: At the annual meeting of the Foreston Telephone Company held the last part of January the following officers were elected: President, J. E. Barker; vice-president, C. D. Mallery; secretary, F. C. Peabody.

BEMIDJI: The Bell Company recently established toll connections between this city and Cook, Big Fork and Burnett, Minnesota. It has also made connections with Rex Siding, east of Cass Lake, and is now negotiating to connect with Federal Dam.

BELLE PLAINE: At the recent annual meeting of the Citizens Telephone Company the following officers were elected: President, Patrick Hessian; vice-president, J. F. Grosser; secretary, J. A. Schaell. It was planned to do considerable building this spring and among the improvements will be a new line on the Number Two road, building a line to connect with the Carver lines and the dividing of some of those rural circuits that are now very heavily loaded.

FISH LAKE (Parkers Prairie): The Fish Lake Telephone Company held its annual meeting the last of January and elected the following officers: President, Henry Quitmeyer; vice-president, Herman Johnke; secretary and treasurer, Albert Ost.

WELCOME: The Welcome-Triumph held its annual meeting in January and elected its officers as follows: President, Harry Sheppard; vice-president, J. J. Helvig; secretary and treasurer, J. W. Wolford.

RUSHFORD: At the recent annual meeting of the City Farmers Telephone Company the following officers were elected for the ensuing year: President, John McLeod; vice-president, M. Eischen; secretary, W. F. Drake.

ANOKA: At a recent meeting of the representatives of six rural lines connecting from the north with Anoka consolidation was arranged and the business is now combined under one management. The following officers were elected: President, W. H. Bradley; secretary and treasurer, J. C. Hauft. William Dill was engaged as trouble man.

LEWISTON: The Lewiston Telephone Exchange Company has just completed the new and up-to-date electric light plant at Lewiston which it financed and will operate in connection with the telephone exchange.

BROWERVILLE: The Riverside Telephone Company at its recent annual meeting elected the following officers: President, R. Gonsor; vice-president, Frank Poplinski; secretary, Joseph Kulick.

MURDOCK: The Murdock-Carlson Telephone Company at its annual meeting this month elected the following officers: President, Theo Frederickson; vice-president, Ernest Johnson; secretary, Edwin Johnson.

HARMONY: The State Line Telephone Company at its annual meeting this month elected John Daly, president; Philip Walsh, vice-president; and John Easlar, secretary.

CROOKED LAKE (Anoka): The Anoka-Round Lake Telephone Company at its annual meeting the last part of January elected the following officers: President, N. J. Armstrong; vice-president, Frank Spohn; secretary and treasurer, C. Woodiwiss.

ALEXANDRIA: The Alexandria Telephone Company is planning to erect a new building this spring and make other improvements in its plant which will cost about $30,000.

GRAND MEADOW: The Home Telephone Company has set

some new poles on main street and will make further improvements in its local exchange this spring.

WINONA: The Tamarack Telephone Company at is annual meeting in January elected the following officers: President, L. K. Strand; vice-president, J. S. Miner; secretary, Ole Garneson.

GREENBUSH: The farmers in this vicinity are planning to construct a telephone line early this spring running north from Old Greenbush.

ELDORADO CENTER (Herman): At a recent telephone meeting held by the farmers in this vicinity it was decided to sever connections with the Lake Valley Telephone Company and build a line of their own.

BELLVIEW: The Redwood County Rural Telephone Company, which owns the exchange here, has recently contracted with the Monarch Telephone Manufacturing Company to install a new switchboard.

VAWTER (R. F. D. Royalton): At its recent annual meeting the Vawter Telephone Company elected the following officers: President, Hans Isaacson; secretary and treasurer, F. F. Callahan.

RENVILLE: The Renville Rural Telephone Company at its annual meeting in January elected the following officers for the ensuing year: President, Paul Albrecht; vice-president, Herman H. Reike, and Herman Schmechel was made manager.

FORT DODGE, IOWA: It is reported that the Monarch Telephone Manufacturing Company has decided to buy the site it has leased for its factory.

GRYGLA: The Grygla Co-Operative Telephone Company at its annual meeting in January elected the following officers: President, John Landro; vice-president, A. Gulseth; secretary and treasurer, Levi Hauckins.

PITT: The farmers of the North Country held a meeting in January for the purpose of organizing a farmers' co-operative telephone company and it was decided at this meeting to build a line the coming spring from Pitt north to Wabanica and Wheeler townships.

FROST: At a recent meeting a new telephone company was organized here to be known as the Village of Frost Telephone Company and officers were elected as follows: President, G. G. Frandle; vice-president, A. J. Nelson; secretary, N. C. Anderson.

FAIRMONT: At the annual meeting of the Fairmont Telephone Company held in January the following officers were elected for the ensuing year: President, A. L. Ward; vice-president, R. C. McCadden; secretary, M. J. Aldrich.

LAKE CRYSTAL: At the recent annual meeting of the Blue Earth County Telephone Company, E. A. Upson was elected president; A. N. Olson, treasurer, and D. E. Bowers, secretary.

MORA: The Kanabec County Mutual Telephone Company recently held its annual meeting and elected officers for the year as follows: President, W. D. Gordon; vice-president, John O. Norling; secretary, Frank P. Powers.

MANCHESTER: The Manchester Farmers Telephone Company held its annual meeting last month and elected the following officers for the ensuing year: President, O. C. Johnson; vice-president, M. H. Donovan; secretary, Alfred Lebeck.

HAVERHILL: The Farmers Telephone Company of this place held its annual meeting in January and elected officers for the ensuing year. Shirley Shonyo is secretary and treasurer.

DELFT: The Delft Rural Telephone Company held its annual meeting last month and the following officers were elected for the ensuing year: President, C. Geortzen; vice-president, P. Quiring; secretary, Jacob Rupp.

CLARISSA: At the recent annual meeting of the Eagle Valley Telephone Company the following officers were elected: President, Henry Jediidka; vice-president, I. L. Anderson; secretary, O. K. Forberge.

STEELE CENTER: The Steele Center Telephone Company held its annual meeting last month and elected Wenzel Kovar, president; Wenzel Jerousek, vice-president; and J. B. Pike, secretary.

PILLAGER (Sylvan Lake): At the recent annual meeting of the Sylvan Lake Telephone Company the following officers were elected: President, Martin Braga; vice-president, J. M. Henry.

MILAN: The Milan Mutual Telephone Company held its annual meeting in January and elected the following officers: President, N. H. Holte; vice-president, George K. Kleven; secretary, C. A. Bystrom.

PARKERS PRAIRIE: The Lake Irene Telephone Company held its annual meeting in January and elected the following officers: President, O. A. Lyon; vice-president, A. R. Zunker; secretary and treasurer, A. J. Abbott.

PARKER LAKE (R. F. D. Wayzata): The farmers in the vicinity of Parker Lake are making efforts to have the Tri-State Telephone Company build a line in their territory.

BLACK RIVER (St. Hilaire): The farmers in this vicinity are discussing the question of building a telephone line this spring.

PRINCETON: The annual meeting of the Bogus Brook Rural Telephone Company was held in January and the following officers were elected: President, Charles Nelson; vice-president, William Talen; secretary, S. Slaghter.

HARMONY: The Harmony Telephone Exchange Company held its annual meeting last month and elected the following officers: President, H. F. Jones; secretary, E. F. Kidder.

ST. JOSEPH: The St. Joseph Telephone Company elected the following officers at its annual meeting in January: President, Richard Dieck; vice-president, Louis Marty; secretary, Charles Dieck.

PINE WOOD: At a recent meeting of the Pine Wood Telephone Company and the Liberty Telephone Company the former company and the Aure Farmers Co-Operative Company decided to connect with the Bemidji exchange through the Liberty Company's lines.

PARKERS PRAIRIE: The Parkers Prairie Telephone Company held its annual meeting in January and elected the following officers for the ensuing year: President, Martin Bony; vice-president, Ole Hanson; secretary, Charles Moll.

MILTON: The Milton Telephone Company at its last annual meeting elected the following officers: President, J. O. Miller; vice-president, Fred Heartfeil; secretary and treasurer, Emil R. Block.

TWO HARBORS: E. Ellingson, president of the Lake Shore Rural Telephone Association of Little Morais stated that his company intended to spend about $1,500 in extending the lines between Two Harbors and Little Morais.

LONG PRAIRIE: The Leslie Rural Telephone Company held its annual meeting last month and elected the following officers for the ensuing year: President, P. L. Peterson; treasurer, Frank Weishair; secretary, C. L. Osman.

RICE LAKE (Long Prairie): The Rice Lake Telephone Company held its annual meeting in January and elected the following officers: President, J. P. Borgert; treasurer, J. Brever; secretary, F. J. Sobota.

COOK: The Cook-Vermilion telephone line will be extended from Cook to Orr this coming spring.

HAGER CITY (Red Wing): The following officers were elected at the annual meeting of the Hager City Telephone Company in January: President, A. F. Anderson; vice-president, Victor Swanson; secretary, M. C. Nelson.

OWATONA: The Independent Rural Telephone Company held its annual meeting last month and elected the following officers: C. H. Wilker, president; John Ebeling, vice-president; and J. E. Patchett, secretary.

BATAVIA (R. F. D. Browerville): The Batavia Telephone Company held its annual meeting in January and elected Luther Sarff, secretary.

WEST UNION: The West Union Telephone Company has under consideration the matter of rebuilding the line between West Union and Osakis.

STAR LAKE (R. F. D. Dent): The annual meeting of the Maine-Star Lake Telephone Company was recently held and the following officers were elected: President, Charles Johnson; vice-president, Adam Vogel; secretary and treasurer, A. O. Chapin.

CARLTON: A. J. Thompson, the manager of the Zenith Telephone Company at this place, has announced that extensive repairs and improvements will be made on the lines in Carlton this coming spring.

ISLE: The Hay Brook farmers have recently organized a telephone company and elected Gust Johnson, president; C. L. Neff, vice-president; and Peter, Brosten, secretary.

WAYSIDE CORNERS (Detroit): At the annual meeting just held of the Wayside Corners Company the following officers were elected: President, Fred Oelke; vice-president, Nic Litzan; secretary, Woolley Olefke.

Official announcement was made by the Southwestern Telegraph & Telephone Company, Austin, Texas, that the first of the year that company would grant a special press rate for long distance service to the newspapers of Texas. This rate is a reduction of 20 per cent below the regular rates. Some time ago the attorney-general's department gave an opinion holding legal the rate to be given for the kind of service to be rendered and this in no way conflicts with the recent opinion of the department denying a special rate to cotton men for straight service.

Public Utility Commission News

Reports Concerning the Activities of State Regulating Bodies in the Telephone Field

Illinois

ENGINEERS of the Illinois State Public Utilities Commission have begun to check the inventory and appraisal made by the receivers of the Central Union Telephone Company of the physical property at Peoria, Ill. The rate case developed as the result of a petition by the city of Peoria to have the rates reduced. This was followed by a petition filed by the receivers claiming that the present rates are inadequate and asking an increase in the rates. A hearing of the case will be held on April 18.

The telephone company's inventory of its plant in Peoria fixes the value at $1,156,299, and states that it would cost $1,337,555 to reproduce it. These figures include every strand of wire—property of whatever kind and character—in the city.

It is stated that for the year ending July 31, 1915, the company's net income in Peoria, after deduction of all expenses, operating cost, etc., is $40,471.72.

When the public utilities commission approves the proposed issue of $3,000,000 Chicago Telephone Company stock, it will be offered to stockholders at par, pro rata with present holdings. With this issue the company's total $30,000,000 authorized stock will be outstanding. President Sunny says company's general construction program this year will require over $5,000,000, compared with less than $4,000,000 last year.

The telephone call, its origin when the receiver is lifted, passage through the switchboard and registration in a meter were embodied in an exhibit before the commission by the Chicago Telephone Company February 9. The telephone company is defending charges made against it by Frank D. Fulton, who complained of overcharges for telephone service at the Kenwood hotel. Commissioner Yates is hearing the case.

Through the exhibit the telephone company is attempting to convince the commission that an excessive overcharge would be impossible with the meter in use.

California

The Empire Telephone Company, operating a telephone system in the village of Empire, Stanislaus county, has asked the commission for authority to issue a certificate of common stock at par value of $35 to each of thirty-eight persons who have paid the corporation that sum and which has been used for poles and wire and telephones.

The Klamath Telephone and Telegraph Company and the Siskiyou Telephone Company, both operating public telephone lines in Siskiyou county, and the latter also in Klamath county, Oregon, have filed with the railroad commission an application for authority for the former company to convey to the Siskiyou Telephone Company about 140 miles of telephone wire and equipment lying to the west and south of Yreka.

The Klamath Company operates a large telephone system, and there is a break between Klamath Falls, Oregon, and Dorris, California, a distance of 30 miles, and another break between Ager and Yreka, a distance of 15 miles. The company cannot acquire a franchise to operate between Yreka and Ager, and therefore wants to acquire certain lines of the Siskiyou company.

The sum to be paid is $6,000.

Indiana

Another chapter to the question of physical connection of the Whitley County Telephone Company and the Farmers' Mutual Telephone Company, Columbia City, was added when the latter concern rejected the proposition of the Whitley County Company that it was ready to make the connection ordered some time ago by the public utilities commission. Recently the Mutual company asked the commission to set the amount of damages on tolls and switching that it claimed would result to it if the connection were made. The commission, which had ordered the connection several months ago, refused to do this, recommending that the companies connect up, and that the commission would do the right thing in settling the amount of damages after the connection had been experimented for six months. An action to set aside the order has been pending in the Whitley circuit court for several weeks.

Commissioner Edwards of the Public Service Commission of Indiana conducted the hearing of the case involving the petition of the Farmers' Co-operative Telephone Company for physical connection with the Commercial Telephone Company.

The Commercial Telephone Company was represented by attorneys Widaman & Widaman, and the Farmers' Co-operative Company by Wood & Gochenour. The Co-operative Telephone Company, by its witnesses, testified to having over four hundred patrons, who are unable at present to communicate with Warsaw, except by going to another telephone off their own line. It is the contention of the Co-operative Telephone Company that public welfare and convenience demand that its patrons should have the opportunity of a toll service over the lines of the Commercial Telephone Company by physical connection of the two lines.

The first hearing on a petition for authority to merge the New Long Distance Telephone Company and the New Telephone Company with the Indianapolis Telephone Company has been set for March 8 by the public service commission.

The filing of the petition follows an announcement that plans were under way for the sale of a majority interest in the three independent telephone properties by J. P. Morgan & Company of New York to Indiana men. Frederick W. Stevens, a representative of the Morgan house and a director in the present companies, spent ten days in Indianapolis negotiating the terms of the merger and transfer with the prospective buyers.

The merger contemplates an ultimate capitaliza-

tion of $8,000,000 for the consolidated company, equally divided between preferred and common stock, of which $1,900,000 of preferred stock and $1,150,000 of common stock will be issued, on the consummation of the plans, for $400,000 of new money, and in lieu of $2,763,600 face value of stocks and bonds of the present companies, which will be canceled. A present valuation of $3,163,000 in cash, stocks and bonds will be surrendered for a new stock issue of the face value of $3,050,000, with a consequent reduction in capitalization of $113,600.

The $400,000 of new money will be available immediately after the merger is approved for additions and improvements in the property.

Articles of association for the resultant single company, to be known as the Indianapolis Telephone Company, are included in the petition. The directors who have been elected to serve under the consolidation are William Fortune, Louis Hollweg, Frank D. Stalnaker, John H. Holliday, A. A. Wilkinson, John B. Elam, John N. Carey, Harry S. New, William E. Elder, L. C. Heusmann and George G. Snowden, all of Indianapolis; William L. Moellering of Fort Wayne, who is interested in an Independent telephone company in that city; Samuel G. McMeen of Columbus, Ohio, president of the Ohio State Telephone Company; F. R. Huntington, president of the Huntington National Bank of Columbus, Ohio, and a member of the executive committee of the Ohio State Telephone Company, and Frederick W. Stevens of Ann Arbor, Mich.

William Fortune will be president, Louis Hollweg and Samuel G. McMeen vice-presidents, Charles S. Norton secretary, and Frank D. Stalnaker treasurer.

Points set forth in the petition are the reduction of capitalization and the decrease of bonded indebtedness from $2,050,000 to $1,556,500. The merger, according to the recital, does not contemplate the present issue of any bonds, and it is not now expected that any will be issued in the future, unless to retire or refund present bonds.

The preamble to the articles of association sets forth the reasons for a merger as follows: "For the purpose of providing new capital for present additions and improvements; providing means through the stock of a single company for financing future additions and improvements; curing involved intercorporate relations now existing that make impossible or difficult the satisfactory financing of such additions and improvements; simplifying the accounts of the business and also the reports to public authorities and to stockholders, and doing away with unnecessary boards and officers."

South Dakota

The railway commission has issued an order requiring the Conde Telephone Company to enter into a contract with the Dakota Central Company to give long-distance connections, on a basis of five cents for incoming and outgoing calls.

Idaho

Complaint has been filed with the public utilities commission by residents of Troy charging discrimination in rates on the part of the Pacific Telephone & Telegraph Company. A similar complaint was filed by citizens of Burke against the Interstate Telephone Company.

Missouri

John M. Atkinson, chairman, and John Kennish, a member of the Missouri service commission, heard sworn testimony January 26 in conducting a hearing at Joplin as regards the Home Telephone Company's application for a permanent increase in rates, concerning the telephone company's "trade boosting" arrangement with the News Herald Newspaper Company.

Through this arrangement, C. J. Myers of Kansas City, assistant to the vice-president of the company and supervisor of records and accounting, testified the Home Telephone Company pays to the News Herald Newspaper Company $100 a month for services that were censured by Judge Kennish.

All of the testimony, except as to the company's dealing with the News Herald, was highly favorable to the telephone company, indicating that its equipment is second to none, that its service is par excellence and that it cares for its women employes in a highly creditable manner.

Salaries of officers of the company were named by W. R. Francisco, expert engineer for the commission, as follows: W. H. Warren, secretary and treasurer, $135 a month; W. O. Randall, general superintendent, $200; F. M. Moore, auditor, $150. The salaries of general officers are paid by 660 systems. In eight months that he had knowledge of, $13,601.47 was paid to operators.

Julius V. Boucher, contract agent for the Kinloch Telephone Company of St. Louis, operating 5,500 telephones, pays $8.23 for each new subscriber it obtains. It costs that much to advertise and push after new business, he said.

When the company obtained 568 new telephone subscribers in 1911, C. J. York, division commercial superintendent for the company, testified, the cost was $8.72 each.

Mr. Myers, who was the last witness heard, testified that the recent cost of adding new subscribers to the Joplin exchange was $7.40 each.

He testified that it cost the company approximately 20 per cent of an issue of $350,000 worth of 5 per cent bonds to obtain capital, but that the Bell Telephone Company took an issue of $382,000 worth of 6 per cent bonds at par, $362,000 in payment for the Joplin exchange and $20,000 as part payment for the Webb City exchange.

Nebraska

The Bell Telephone Company, Milford, has been granted a permit from the state railway commission to raise the charges for switching the Farmers' Telephone Company from 25 cents per month to 50 cents per month.

Railway Commissioner Hall does not concur in the order made by his two colleagues granting the Lincoln Telephone & Telegraph Company permission to increase its farm line switching rates at Seward and Milford from 25 to 50 cents per month. He prepared an opinion dissenting from the order.

Hr. Hall says there was not an iota of evidence in the case to show that the company needed more revenue in order to make money on its investment. The reason assigned by the other two commissioners for allowing the raise was that the 50 cent rate is charged elsewhere. Hall's view is that the switching

rate should not have been raised without equalizing rates by making reduction somewhere else.

The appeal of the Lincoln Telephone Company from the order of the state railway commission in the matter of the People's Telephone Company of Sterling has been dismissed by agreement between the Lincoln company and the organizer of the Sterling company. By stipulation the costs are to be paid by the Lincoln company.

The Sterling company proposed to establish a competing exchange and its right to do so was challenged by the Lincoln company, which is operating an exchange at Sterling. The railway commission was asked to approve an issue of capital stock by the new company. A majority of the commisison decided that while a second exchange in Sterling would be detrimental instead of beneficial, it had no authority of law to refuse approval of the proposed issue of capital stock. The commission reduced the amount of capital stock deemed necessary to finance the new company and gave approval to the issue. The Lincoln company appealed from this order to the supreme court.

A general increase of telephone rates in Hamilton county and neighboring territory has been authorized by the state railway commission in an order recently issued. The raise in rates was asked by the Hamilton County Farmers' Telephone Association, originally a co-operative company but now engaged in the commercial telephone business. It applies to Aurora, Donphan, Giltner, Hampton, Hordville, Marquette, Phillips, Stockham and Trumbull.

At Aurora the business rate is increased from $1.50 to $2.25 on telephones owned by the subscribers, and from $2 to $2.25 on telephones belonging to the company; residence rates from $1 to $1.50 where the patron owns the telephone, and from $1.50 to $1.75 where he does not. A discount of 25 cents will be allowed where the rental is paid by the 15th of the month.

Hordville rates, which were already higher than those of some of the other towns, are left practically the same as before, except that non-payment by the 15th of the month will add 25 cents to the bill. An exception is made in the case of business phones owned by the company, on which the net rate will be 2, or 25 cents less than it now is.

The railway commission has granted the application of the Lincoln Telephone & Telegraph Company, supported by the Nebraska Telephone Company and Polk County Telephone Company, for permission to discontinue free service as now given between Silver Creek and Osceola. Patrons who have had this service objected to its abandonment. The commission's order says that while the subscribers had some sort of an agreement providing for the service, the conditions have changed and the contract would not now be binding.

The Lincoln company has also been granted authority to discontinue the exchange at Inland. The patrons there will be conected with the Hastings or the Harvard exchange, as each one elects, and will pay the rates charged for service at those places.

New York

Senator Foley of Albany on February 9 introduced a bill authorizing the Public Service Commission, second district, to hold a hearing on its own initiation when a telegraph or telephone company files a schedule proposing an increase in rates. The bill places the burden of proof upon the company to show that the increased rate is reasonable. Another bill introduced by Senator Foley includes holding corporations within the title of telegraph or telephone companies.

On an opinion by Commissioner Irvine, the Public Service Commission finds that the complaints of the Board of Trade of Malone and others against the Mountain Home Telephone Company and other companies have not been proven in any respect, and dismisses the complaints. Commissioner Irvine, analyzing the testimony that has been presented in the light most favorable to the complainants, finds that it shows the company's return on its property employed in the public service was but ¾ of one per cent and 1¾ per cent in the first half of 1915, without including interest charges in the expenses.

"The complaint," says the opinion, "so far as it affects the rates is therefore not justified. So far as it affects the service it was at the time it was filed justified, but improvements have been made and no specific order is now practicable which would insure further improvement. This must be left to the continuing efforts of the company and the continuing supervision of the commission."

In the early stages of the proceedings the commission determined that it had not the jurisdiction to compel the dissolution of the Mountain Home Company into its constituent corporate parts or to decree a restoration of property already legally transferred. The commission then offered to submit this question of jurisdiction to the courts if the complainants desired, but this offer was not availed of and the commission maintains its position on this feature of the complaint.

The decision of the case of the Malone Board of Trade against the Mountain Home Telephone Company carries with it the dismissal of similar complaints by patrons of the Chateaugay and Burke exchanges, against toll charges, and by Pomona Grange as to rates in Canton. All these cases were heard together and the same decision is made for all, on the grounds set forth in Commissioner Irvine's opinion.

Commissioner Irvine reduces the allowance for depreciation claimed by the company to $75,000. Yet even with these cuts in favor of the complainants' contentions, the company is shown to be earning but the ¾ per cent and the 1¾ per cent above alluded to.

The only changes in the present schedule recommended for the study of the company is a possible flat rate of $6 a year for extension telephones.

The Public Service Commission has also found that it is without power to adjust and has dismissed the complaint of the Paul Smith's Hotel Company against the Mountain Home Telephone Company as to rates. The commission finds that the Paul Smith's company has never submitted itself to the jurisdiction of the commission as a telephone corporation and that it is not an ordinary subscriber to the service of the Mountain Home company, as it has practically an independent system of its own connected with the Mountain Home system on a contract basis.

The law requiring the exchange of despatches between companies, the commission finds, is plainly applicable only to telegraph companies, and the com-

mission is hence without power to handle the situation complained of.

Montana

In an order recently issued the state public service commission refused to reduce the telephone rate on a rural line out of Kalispell, on the ground that the concern was a losing proposition. Farmers of Kalispell had filed complaint charging that the Northern Idaho & Montana Power Company was charging too high a rate for its service.

They also complained of poor service. The complaint referred to the month of August, when the line was out of commission for three weeks. The testimony showed that during this period there were many violent thunder storms which had ruined the main cable, necessitating the work of an expert. The commission ordered the company to credit the subscribers with $1.50 each for the lack of service in August.

Oregon

The Pacific Telephone & Telegraph Company at Salem, recently notified the Public Service Commission that it had no objection to the provisional rates established by the commission in Corvallis. The case came before the Commission upon complaint of the Carvalis Independent Telephone Company.

In its reply the Pacific stipulates that the provisional rates shall not act as a precedent in the establishment of rates in the future, or prevent the company from asking the commission for a change in the provisional rates, pending the final determination of the general rate investigation now being made by the commission.

The Commission received an application from the Pacific Telephone & Telegraph Company for permission to discontinue its station at Government Moorings, between Portland and Linnton. The company declares that the station is no longer needed, as the service is supplied from the Portland exchange.

Washington

Testimony was submitted by the Pacific Telephone & Telegraph Company to establish the accuracy of the company's estimate of the cost of reproduction of the plant and equipment in Washington, $26,892,700. Several of the items in the estimate are attacked by the attorneys for the state and the cities of Tacoma, Seattle, Spokane and North Yakima.

C. E. Flaeger, telephone and equipment engineer, employed by the company, on the witness stand explained the basis for the estimate of the reproduction cost and the difference between that and the actual cost of building the plants in this state. Five years was the time estimated by Mr. Flaeger in which the present plant could be most economically reproduced. A longer period, he said, would increase the total interest charges, estimated at about $1,000,000 a year, and a shorter period would increase the cost of labor and material.

Wisconsin

The state railroad commission announced its decision as arbitrator in a controversy between the county of Ashland and the Ashland Home Telephone Company of Ashland over the company's bills for service to the county. The commission decided that the points at issue had been fully passed upon by the circuit court of Ashland county and the the State Supreme Court, and that it was not within the province of the arbitrators to question or attempt to overrule the legal decisions presented. It was held that the question of reasonableness of rates did not enter into the controversy.

The Railroad Commission has issued an order to the six telephone companies operating in Hingham requiring them to maintain a central switchboard so that residents may telephone to each other without having six instruments in each home.

The Wisconsin Railroad Commission has authorized the East Valley Telephone Company of Campbellsport to issue $16,000 in stock for the pupose of paying for its plants and making extensions and improvements.

Nevada

The commission has ordered that the charges of the Bell Telephone Company of Nevada for telephone extension service within the same building or apartment shall be no more than 50 cents per month for each separate extension without bell, and 65 cents per month for each separate extension with bell. The company pleaded inadequate earnings, but the commission held that inadequate aggregate earnings did not warrant an unreasonably high charge on one class of service.

Mackay Interests Busy in East

Plans are now being worked out by a corps of electrical engineers which, if the proposition proves practical, will result in the bringing of an Independent telephone company to Baltimore, Maryland. The interests said to be behind the new concern are the Mackay companies, which control the Postal Telegraph Company. The proposition of establishing another telephone company has been under consideration for some time.

Quietly, several hundred business and financial men of the city have been sounded as to their attitude should the company become a reality. Practically all of them, according to an official of the Postal Company, are solidly in favor of the new company. The primary object, it is understood, is to compete with the Chesapeake and Potomac Telephone Company, which is a part of the Bell system. Through the introduction of service other than that of the present compay it is hoped rates between different points will be materially lowered, or the speaking time increased several minutes.

The wires of the new company will serve two purposes, the transmission of telegrams and the sending of word messages. Whether the new company, before it can successfully operate telephones in this city, will strike any legal snags was a matter of much speculation. It is not thought the move would be questioned by the Public Service Commission of Maryland, nor is it believed that an act passed by the General Assembly authorizing the formation of such a company will be necessary. Moreover, the new company would not be incorporated under the laws of Maryland, its charter granted in the state of Delaware providing for ample expansion at the will of the officials.

Telephone Patents Issued Recently

A Brief Digest of those Current Specifications Most Interesting to Telephone Men

BY DAVID S. HULFISH

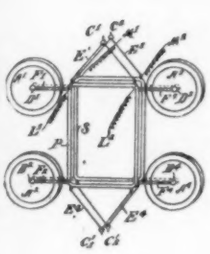
NO. 1,160,181. Automatic Call-sender System. Issued to F. R. McBerty and David Koenig, assignors to Western Electric Company, New York, N. Y. The callsender interrupts the loop circuit to send a group of signals, and the last interruption is made long enough to operate a device at the central office to change over to the next switch to be controlled.

1,160,294. Harmonic Ringer. Issued to O. M. Leich, assignor to Cracraft-Leich Electric Company, Genoa, Ill. The distinctive feature is that the armature is normally closer to one magnet core than to the other.

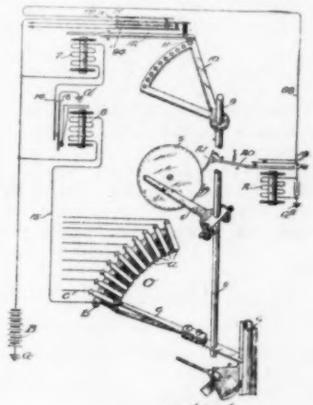
1,160,356. Speed Meter. Issued to A. H. Adams, Sparkill, N. J., assignor to Western Electric Company, New York, N. Y. The dial of a callsender for automatic telephone has index marks upon it which, at proper speed, correspond in time to a testing tuning fork. By looking through an interference device controlled by the tuning fork, the index marks appear to stand still when the callsender speed is right.

1,160,447. Test System. Issued to L. Polinkowski, assignor to Western Electric Company, New York, N. Y. In an automatic selecting switch, the selected circuits are used in rotation by the ruse of leaving the switch in its last position of use, then testing only between positions, so that the switch must make at least one step before coming into use again.

1,160,547. Speech Relay. Issued to C. Stille, Zehlendorf-West, Germany. Primary and secondary coils are suspended, movable toward and from each other. Resistance coils are connected mechanically to be compressed by the coils when moved by incoming currents.



1,160,294



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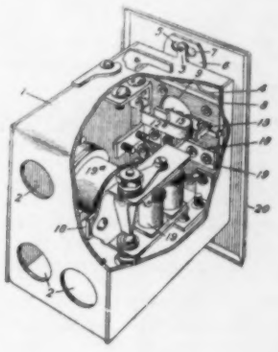
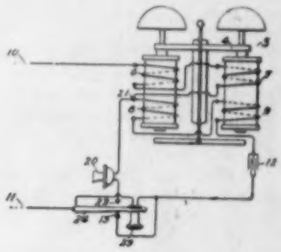


1,161,214



1,160,547

1,160,951. Moster Switch Control System. Issued to O. V. Olson, assignor to Automatic Electric Company, Chicago, Ill. A system of relays and a mechanical locking device for setting the plungers of a Keith line switch.

1,160,994. Toll Device for Automatic Telephones. Issued to John Erickson, assignor to First Trust and Savings Bank, Chicago, Ill. (Filed November 12, 1906.) The induction coil is shunted by a magnet when a call is made from the telephone, and the shunt may be opened by deposit of a coin or by a second magnet controlled from the central office.

1,161,010. Combined Drop and Jack. Issued to Michael Setter, assignor to First Trust and Savings Bank, trustee, Chicago, Ill. (Application filed December 6, 1906.) A combined drop and jack, the armature of the drop being held by a spring clip, and being detachable (for removal of spool) without disturbing the remaining portions of the device.

1,161,048. P. B. Ex. System. Issued to H. L. Harris, assignor to Garford Manufacturing Company, Elyria, Ohio. In a manual switchboard private branch exchange, a call from the main exchange may be passed to a local branch telephone and disconnection is left under control of the branch telephone. Also, two local telephones may be connected and may be automatically disconnected upon hanging up the receivers.

1,161,126. Automatic Selector. Issued to G. Grabe, assignor to Siemens & Halske, Berlin, Germany. A power-driven switch has a test magnet, the armature of the test magnet being a mechanical stop to check the switch. The normal positions of the switch are longer than a single step, to obviate over-shooting.

1,161,191; 1,161,192; 1,161,193 and 1,161,194. Process of mounting Insulated Electrical Parts. Issued to Frank B. Cook, Chicago, Ill. The electrical part, as a relay spring, jack spring, or plug ring or tip, is held in a form and insulating material is molded upon it. This obviates detached bushings when assembling the parts.

1,161,196. Semi-Automatic Exchange. Issued to Elmer R. Corwin, assignor to Frank B. Cook Company, Chicago, Ill. A calling telephone automatically selects an idle cord pair. The operator then operates selectors to select the line asked for.

1,161,214. Trunking Circuit. Issued to E. E. Hinrichsen, assignor to Western Electric Company, New York, N. Y. The trunk may connect with a common battery line or with a magnetic line; in the former case, a circuit through jack body to earth operates a relay which in the latter case remains unoperated.

1,161,411. Testing System. Issued to L. Polinkowski, assignor to Western Electric Company, New York, N. Y. In a power-driven switch, the test relay opens the power circuit, and a delay is provided for continuing the test circuit after the power circuit has been opened.

1,161,602. Overflow Trunking System. Issued to C. G. Bradbury, assignor to Western Electric Company, New York, N. Y. Each line switch has some of its contacts connected to selectors and a few connected to line switches in another line group, that selectors of the second line group may be available to lines of the first line group in emergency.

1,161,608. Semi-Automatic System. Issued to A. M. Bullard, assignor to Western Electric Company, New York, N. Y. (Application filed February 5, 1907.) In an automatic switch, a party line has a different set of contact points for each station, and as the switch selects the point corresponding to the station desired it selects also a source of ringing current suitable for ringing the desired station.

1,161,615. Call-Indicating System. Issued to H. P. Clausen, assignor to Western Electric Company, New York, N. Y. A selector at the operator's position picks up a calling line, and an indicator before the operator shows the directory number of the calling line thus picked up.

1,161,639. Loud-Speaking Receiver. Issued to H. C. Egerton, assignor to Western Electric Company, New York, N. Y. A bar armature is used, with fulcrum at one end and a sound-diaphragm at the other end, the armature being operated by solenoid plungers near the fulcrum.

1,161,655. Line-Switch System. Issued to C. L. Goodrun, assignor to Western Electric Company, New York, N. Y. (Application filed May 1, 1909.) In a series of line groups in line-

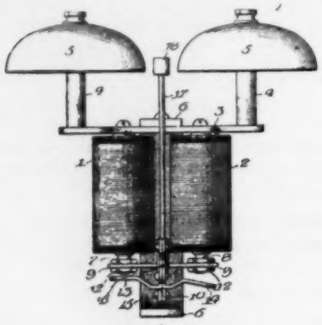
finder switches, each line is given precedence in one switch or more, and is given less prominence in other switches. The effect desired is to reduce the total of searching movements.

1,161,783. Release System. Issued to J. L. E. Meyer, assignor to Automatic Electric Company, Chicago, Ill. Specific circuits for the release relay of the Keith line switch and stronger selector are claimed.

1,161,837. Automatic Switch. Issued to W. M. Bruce, Jr., assignor to International Automatic Telephone Company, Springfield, Ohio. A selecting switch has two sets of wipers, both engaging line tags at the same time, and a relay determines which set shall be included in the selective circuit of the switch.

1,161,854. Callsender. Issued to O. F. Forsberg, assignor to Western Electric Company, New York, N. Y. In a callsender of the rotary type, a single clamping element holds all of the parts together.

1,161,856. Loud-Speaking Receiver. Issued to Sergius P. Grace, and R. A. L. Snyder, Pittsburgh, Penna. A bar armature is hung like a ringer armature, with one end of the polarizing



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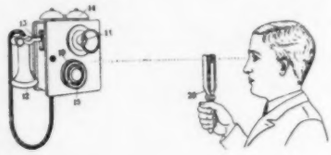
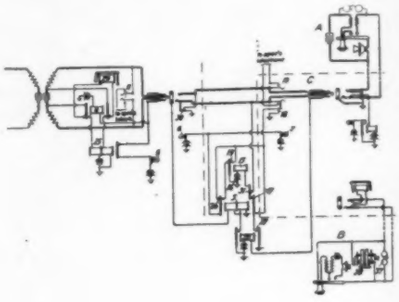


1,161,863



1,162,069

magnet near the pivot at the center of the armature. An extension arm from one end of the armature operates the receiver diaphragm.

1,161,863. Telephone Set. Issued to R. R. Ireland and A. F. F. Gilson, assignors to Western Electric Company, New York, N. Y. A compact set for hotel or house or hallway systems. All parts mount within a compact core except the receiver and the case mounts within the wall with a flush plate upon the wall.

1,161,874. Semi-Automatic System. Issued to W. H. Matthies, assignor to Western Electric Company, New York, N. Y. An idle operator selects a calling line through two orders of line-finding selectors.

1,161,884. Contact Bank and Brush. Issued to John N. Reynolds, assignor to Western Electric Company, New York, N. Y. To prevent the moving brush from bridging together two tags in the contact bank, the conductor of the brush is encased in a shoe of insulating material.

1,162,007. Message Register. Issued to J. A. Walton, assignor to Western Electric Company, New York, N. Y. The device is mounted at the telephone and a plunger or press button is operated by the telephone man to set the device ready to register. A polarized magnet within the device releases it to register when current of predetermined direction is received from the central office.

1,162,069. Telephone Set. Issued to K. S. Johnson, assignor to Western Electric Company, New York, N. Y. The windings of the ringer spools are used as an induction coil for the speaking circuits.

1,162,514. Key. Issued to J. N. Reynolds, assignor to Western Electric Company, New York, N. Y. The same key plunger has two (or more) sets of switch springs and operates them in turn for successive pushes of the plunger.

1,162,556. Automatic System. Issued to G. A. Betulander and N. G. Palmgren, assignors to Betulander Automatic Telephone Company, London, England. In the system of selection, the desired line is determined, and then a selection among link circuits is made to determine a link circuit suitable to serve the connection.

1,163,390. Automatic Selector. Issued to W. M. Bruce, Jr., assignor to International Automatic Telephone Company, Springfield, Ohio. The selector has several sets of wipers in contact with line tags, and the controlling impulses which adjust the selector also determine the wipers which shall be used, and disconnect the remaining wipers.

1,163,852. Trunk Circuit. Issued to R. L. Quass, assignor to Western Electric Company, New York, N. Y. Quick and slow relays are used, and by the difference of time in their actions a signal is sent over the trunk conductors.

1,163,899 and 1,163,900. Automatic Telephone Systems. Issued to A. H. Dyson, assignor to Western Electric Company, New York, N. Y. Two devices for detecting and indicating the end of a series of signal impulses.

1,163,953. Call Distributing System. Issued to J. G. Roberts, assignor to Western Electric Company, New York, N. Y. When a subscriber lifts his telephone his line is connected immediately to an operator's position, the connection being severed when the call is connected by the operator's plug.

1,164,213. Automatic Sequence Switch. Issued to J. N. Reynolds, assignor to Western Electric Company, New York, N. Y. A rotatable shaft operates many switch springs, in the general nature of a sign flasher. The switch springs are worked by tongues of metal pressed out upon disks carried by the rotatable shaft.

1,164,271. Automatic Switch. Issued to B. G. Dunham, assignor to Western Electric Company, New York, N. Y. A propelling and testing circuit for a searching switch in an automatic exchange.

1,164,407. Telephone Relay. Issued to Josef Schiessler, Baden, Vienna, Austria. In the local circuit, a filament is caused to glow, and then it is acted upon by diaphragms controlled by incoming weak currents to vary its heat and thereby to vary its resistance.

1,164,479. Restricted Service in Automatic Exchanges. Issued to Gerald Deakin, Berkeley, Calif. The selectors used by some telephones are unable to call above a predetermined number, thus restricting the service given to those stations.

The Telephone Man's Hereafter

(From the Telephone and Telegraph Journal, London.)

When the very last call is connected, and the cords are all twisted and dead;
The very last headset broken, and the last "number please" has been said,
We shall rest, and faith—we shall need it; lie down to dream and sigh,
While the T.18's are preparing—to be answered by and by.

And those that are good shall be happy, they shall sit in an Avenue chair.
They shall use what expressions they fancy, without ever turning a hair.
They shall find real Saints to answer—Basil and Bernard and Paul,
And one or two more Exchange managers—strange that they got there at all!

And only the Master shall praise us, and only the Master shall blame.
We never have worked for money; all we have got has been fame,
And each for the joy of the working, and each in her separate star,
Will gladly tell the subscribers what their characters usually are.

Boy—Lady wants you on the telephone, sir!

Boss—Tell her I'm busy.

Boy—All right; she said if you were busy not to disturb you.

Boss—U'm! That can't be my wife. Tell her I'll be there right away.

Of Interest to the Trade

What the Telephone and Accessory Manufacturers Are Doing to Advance the Art

Stromberg-Carlson's Mine-a-Phone Bulletin

The Stromberg-Carlson Telephone Manufacturing Company, Rochester, New York, has reprinted a new edition of Bulletin No. 1000 on the Mine-A-Phone and its associated equipment. The new bulletin is nicely printed on a white dull coated paper stock. Many illustrations are shown which do full justice to the subjects they represent. The size of the bulletin is 7¾ inches by 10 inches and is punched to fit the company's standard binder. The cover stock is a trifle heavier in weight than the inside pages, and upon the first page of the cover is shown an attractive illustration of a mine equipped with a Mine-A-Phone system.

An interesting report made by the United States Bureau of Mines appears in the introductory pages. It sets forth the many benefits of a telephone system in mines and tells, at some length, of the accidents of various natures which commonly occur in mines and which can be avoided to a considerable extent by the installation of a mine telephone system.

Complete information is contained in the bulletin on the several types of telephones best suited for surface stations, etc., and a practical plan is briefly outlined on how to go about the wiring, install the telephones, the bells and other miscellaneous parts which the installation of a telephone system would naturally involve. A diagramatical view is shown which hakes the instructions easily comprehended.

Any telephone company or interested party who desires to obtain a copy of this new bulletin should apply to the Stromberg-Carlson Company's advertising department at Rochester, New York.

Kellogg Universal Board at Manistique Mich.

A new "Universal" switchboard system is being installed by the Manistique Telephone Company and upon completion of the installation, it will be in position to give the finest telephone service in that part of the country.

A "Universal" switchboard gives two kinds of telephone service at the same time. First, magneto service, making it necessary, in calling central, to turn a crank which operates a signal immediately above the subscriber's jack or line, ending on the switchboard. Second, common battery service in which all current for calling central, calling subscribers and talking is furnished by a storage battery located at the central office.

This does away with the dry batteries in the telephone and also does away with the hand magneto generator, so that there is no longer any crank to turn, as central is called automatically when the subscriber takes the receiver off the hook. One storage battery at the central office furnishes all the power. This simple and necessary act automatically closes the battery circuit, which automatically operates a relay or electric switch at the office, which automatically operates a lamp immediately above the subscriber's answering jack in which the connecting plug is inserted.

The magneto lines in the new switchboard will also be answered by means of these lamps and only rural party lines will terminate in a mechanical signal drop shutter, which signals the attention of central.

The operator cannot overlook the small lamp in answering any calls, whether magneto or common battery, because the equipment is so arranged that a large pilot lamp, in front of each operator, lights up automatically whenever one of the small lamps lights, and at night an alarm bell is operated automatically in addition to the small and large lamps.

The Manistique switchboard is one of the largest and handsomest in that part of the country. It is built by the Kellogg Switchboard & Supply Company. In every respect it is of the very latest type, offering a service to the people of Manistique far superior to the average town where monopoly service is the rule.

The switchboard itself is of heavy quarter-sawed oak woodwork on a steel frame. The chief operator is equipped with a handsome oak desk of her own which enables her to keep in touch with all of the operators at the board and know exactly what is going on all the time.

The wire chief has another handsome oak desk, equipped so that he can promptly and efficiently test every line in the system, and with the help of his men, is able to correct trouble in almost every case immediately upon its being reported at the head office. In his department are the large relay racks and power equipment.

The operators will all talk over Kellogg transmitters. There are today over a million and three-quarters of these transmitters in service in all parts of the world, many thousands in use for ten years or more.

For those who wish a more economical service, the magneto telephones receive just as much attention for that style of telephone connection as the best anywhere obtainable. Those willing to pay a little more for the common battery equipment receive the advantages of this style of telephone connection. It all depends on the viewpoint. The renting of telephones has been compared to the selecting of seats for the theater. The best class of seats, of course, have a somewhat better view of the stage and are desired by many for various reasons, but from the gallery seats the best performances can be viewed and by many considered just as satisfactory.

Stromberg-Carlson No. 10-A Repeating Coil

The Stromberg-Carlson Telephone Manufacturing Company, Rochester, New York, has recently placed upon the market a "talk-through" and "ring-through" repeating coil for simplex, composite and phantom circuits. The new coil has been coded No. 10-A and it is claimed by the company that its introduction in a circuit causes only a small transmission loss equivalent to 0.4 mile of standard cable, and that its ringing efficiency is proportionately high.

The closed magnetic circuit of the No. 10-A repeating coil consists of an assembly of thin silicon steel laminations. The coils are carefully wound and impregnated with armature varnish. They are then baked to exclude moisture and to preserve high

efficiency. The case is made of drawn steel and filled with an insulating compound which the company affirms solidifies and hermetically seals the equipment. All terminals are numbered to facilitate installation. The dimensions of the complete coil are 5¾ inches by 4⅛ inches by 2⅛ inches.

Section C of the Stromberg-Carlson Company's apparatus bulletin describes completely this new repeating coil and any telephone company or person interested may obtain a copy by writing the advertising department at Rochester, New York.

Telephones in Hard Coal Mines

Steady progress is being made in the installation of telephones throughout the anthracite mines of Pennsylvania. There are now instruments in the mines of practically all the large companies at the foot of every shaft, at the head and foot of all main slopes, in the mine hospitals below ground, and wherever there is machinery for pumping or hoisting. Breakage of machinery, fires and accidents can thus be promptly reported, and the telephones form a speedy method of communication between the footmen and hositing engineers in case anything goes wrong with the signal system. Orders are transmitted freely, the installations have proved a valuable adjunct to car dispatching, and some of the engineers in charge of this work pronounce it one of the greatest steps in efficiency, and consequently in safety, of recent years.

Credit is due to Chief James E. Roderick of the Pennsylvania Department of Mines, who strongly recommended the further extension of mine telephones three years ago. Some of the large companies have the mine systems connected directly with those on the outside, so that instead of taking the time to come out of the mines or having their messages relayed at the switchboards in the colliery offices, men wishing to report can call up the main office direct. In case of mine fires or accidents it has happened that a man at the scene of the accident or within view of the fire has called the main office and secured prompt assistance. This means that the wheels of the fire or rescue cars can begin to turn within a few minutes after the accident or fire is known, and that lives have been saved by the prompt summoning of a first-aid team from the nearest mine hospital.

In addition to the systems permanently installed in the mines, the rescue and fire fighting squads are provided with portable instruments equipped with reels of lighter wire so that the service can be temporarily extended to wherever it is needed. Special insulation is necessary for the permanent wires to protect them from the destructive sulphuric acid present in mine water, and the transmitters and receivers are installed in special boxes protected with paraffine.

There are now thousands of telephones in the mines in constant use. All vagaries of the air currents are promptly reported to the mine foreman, and when the presence of gas is detected or a pocket of it released, that part of the mine can be immediately vacated until the gas is swept away. The effect in reducing loss of life as well as in saving property has been enormous.

The miners no longer work silent and detached, but can communicate promptly with the mine hospitals where first-aid corps are stationed, with all important points in the mines, and with their friends. In fact the telephone in these underground industrial villages corresponds exactly in its use with the system in any similar community above ground. If a mine worker felt like calling up San Francisco from the bowels of the earth there would be nothing to prevent him except possibly the expensive toll.

Trade Conditions

The Kellogg Switchboard & Supply Company reports many shipments during the new year of unusual promptness and efficiency.

Last week a 600 line magneto "fireboard" was shipped within two days. This board was less than thirty hours in the shop.

The equipment was a standard quarter-sawed oak cabinet of three operators' positions, forty-five cord circuits, double clear-out, transfer equipment, and breast plate transmitters.

For the protection of its customers, especially at this season of frequent fires, the Kellogg Company holds in readiness a variety of standard switchboards, for prompt shipment, in sizes up to and including 300 and 400 line switchboards, with cord circuits and all wiring complete.

Sixty orders for switchboards are now in the shop —a gratifying record, with telephone orders surpassing all previous sales for many months.

"No holding of orders" is the shipping record, as a splendid, complete stock of all standard telephones is maintained.

Another instance of the splendid Kellogg service is the shipping on schedule time of 1,500 special telephone sets, where all cabinets were made special, the order requiring the making and assembling of a vast number of parts.

The Kellogg Company also reports that orders for its now famous high-efficiency No. 97 common battery telephones have far exceeded expectations.

How to Figure Illumination

A new edition, the sixth, of the complete little handbook, "How to Figure Illumination," is ready for distribution.

This booklet lists complete tables and full illuminating data as well as illustrating and describing with complete characteristics all the various sizes and styles of Sunbeam Mazda lamps. The information contained in this booklet, together with curves and illustrative matter is sufficiently complete to enable one to lay out any illumination plan. A copy of this booklet will be mailed, gratis, to anybody writing for it to the Western Electric Company at Chicago, New York or any of the distributing houses throughout the United States.

S-R Electric Exhibit

The S-R Electric Company exhibited at the Wisconsin state convention at Madison, where the demonstration of the S-R private service system as applied to rural party lines drew large crowds of interested Wisconsin telephone men. The interest taken in S-R private service attachments can be noted by the fact that some several companies have arranged for a meeting in March at a certain city where the mayor is going to put a room of the city hall at the disposal of the telephone companies, and they want the S-R Electric Company of Chicago to have a representative private service attachment to telephone instruments

furnished by the telephone companies. After a thorough practical test and try out, these companies assert they will buy and install two thousand S-R private service attachments, assured in the belief that the S-R system gives the real basis for a raise in rates.

Another feature of S-R Electric Company's exhibit was the S-R automatic battery cut out, or battery saver. The main feature of this is that it works on any local battery telephone instrument, being installed in a few minutes without even taking the instrument from the wall.

Book Review

PRINCIPLES AND PRACTICE OF COST ACCOUNTING, by Frederick H. Baugh, has for its object a comprehensive and practical presentation of the general principles upon which cost accounting for manufactured articles is based, the application of these principles in a general manner to the most common types of manufacture and the illustration of the details. These latter vary so greatly under different manufacturing conditions, and may become so numerous and complex, that any work on this subject would seem incomplete which did not deal thoroughly with them. However, no one book, on even manufacturing cost alone, could hope to cover the subject in its entirety.

It is the aim of this work to illustrate the principles by methods which eliminate from the financial accounts and segregate the quantities and values used on manufactured goods into accounts known as cost accounts. Printed forms are used that are very clear and concise, wherever possible, to take care of the analytical work.

The great objection to cost finding is due in many cases to the number and complexity of the books and forms proposed and the extra labor incidental to their keeping. The author has very ably shown in this work that very little, if any, addition to the books which a corporation should ordinarily possess for the recording of its transactions, is needed.

The treatise will no doubt be very helpful to accountants, manufacturers, engineers, teachers and students, as the ideas are so conveyed that they are very clear and adaptable.

Wood Preservation an Economic Necessity

In the last few years, prompted by the increased price of telephone poles, there is hardly a pole set nowadays without the owner having some idea of preserving it. He begins to compare what he or his predecessor formerly paid for a pole with the present price, hence he begins to figure and says to himself, "How can I stop this dividend-eating expense of replacing rotten poles?" If a manager or engineer has not brought the subject before the directors it is only a question of a short time until he will, for he is realizing what others are doing and is discovering the increased profit or decreased maintenance expense his competitor is obtaining by having preserved his poles years ago.

The normal yearly production of poles in the United States is approximately three million pieces, and today there are approximately over fifty million poles supporting wires, either telephone, telegraph, light or power.

Northern and western cedar are the principal woods used for telephone poles, and to begin with they have a long life, and treatment which more than doubles this and reduces the annual charge per pole.

The question of preservation nowadays is coming out in a number of specifications for line work, treating the cross arms, pins, and poles. Often conduit blocks, woodwork in manholes, aerial cable guards, and such pieces are being treated which a few years ago it was not thought profitable to treat.

By doubling the life of this wood a substantial saving is made, and with the increased price of lumber and labor and the doubly increased price of making chnages of poles, or other woodwork in line construction, it is very important that the wood put into the line work should be made to last just as long as it possibly can be done.

Agricultural schools in the different states are now taking up the subject of wood preservation. Colleges are putting in forestry courses of which wood preservation is a part and the subject is being given now more consideration than ever before.

Deteriorating lumber is like a great many leaks that will be found in large establishments and cause a drain on the treasury of the company, and when discovered are promptly checked. This applies to poles and cross arms, as they form a substantial part of the company's investment, and as time goes on they are getting weaker and the replacement is considerably more than the original installation.

In the last seven years there has been installed by the pole companies about ten treating plants distributed throughout their various yards, and during the last year approximately sixty per sent of the inquiries received call for butt treatment.

For open tank or brush treatment, the class of oil that should be considered is the highest grade that can possibly be obtained, for the reason that capillary attraction is depended upon to carry the oil in through the sap wood. If low grade or light oils were used, they would evaporate, and the money for treatment would be uselessly expended. The following is a typical analysis or specification of a high grade pure coal tar distillate:

Specific gravity at 38° C., 1.11 to 1.13.
Flashing point, above 120° C.
Burning point, above 165° C.
Distillate below 235° C., not exceeding 2 per cent.
Distillate between 235° C., and 300° C., not exceeding 10 per cent.
Pure liquid coal tar oil residue at and above 300° C., over 90 per cent.
Tar acids, less than 2 per cent.
Sulphonation residue, less than .25 c.c. (or 0.25%).
Constituents insoluble in benzol, less than 0.25 per cent.
Form at 38° C., liquid.
Ash left on ignition—not exceeding 1 per cent.

It must be a true product of coal tar free from any adulteration. Furthermore, the distillates between 350° and 400° C., will congeal or solidify on cooling.

It must be a by-product of petroleum, water gas tar, or oil tar.

It is essential that it be a pure, unadulterated product, free from petroleum and ungermicidal oils, pitch and tar. Wood preservation is based on germicidal action, and the germicide should remain indefinitely in the wood and not evaporate or leach.

Poles which are already erected and which have begun to show decay can be saved by a very simple method, and that is by digging away the earth to a depth of about two feet around the pole, remove the decayed wood and allow the pole to dry for a few days. Then apply two coats of a good preservative with a brush and replace the earth and the pole is saved.

Almost any man can finish satisfactorily the work that is given him; but the employe who knows what to do next will be his boss some day.

Oshkosh to Deal Through Jobbers

A great deal of discussion and comment, favorable and otherwise, has been aroused among central station companies and telephone companies concerning the policy of the Oshkosh Manufacturing Company in marketing its entire product through the legitimate electrical jobbers.

Up to about two years ago the Oshkosh Manufacturing Company sold its product to both the jobber and the consumer—with plenty of accent on the latter. Many features developed which were unsatisfactory both to the consumer and to the Oshkosh company, and the latter felt that some remedy was imperative.

"It was out of the question," said J. W. Wooley, sales manager of the Oshkosh company, who was asked to make an explanation of this policy, "to attempt to raise prices to the consumer to care for the crying need for 'service,' and as a result we had to devise a better method.

"To convince the consumer that we are familiar with both sides of this discussion, I want to say that we made a thorough and detailed study of the question. Among other things we found that the average amount of an order from an operating company was only a small fraction of the amount of an order from a jobber, but that the cost of filling each order was the same. While a little time could be saved in assembling the smaller amount of tools listed on an order from an operating company, the saving was lost in the increased ratio of cost of special packing cases, etc.

"A large percentage of these orders," Mr. Wooley continued, "come to us from operating companies that did not have a copy of our catalogue, and therefore did not have our catalogue numbers available. This necessitated further correspondence to ascertain just what the company required, and therefore long delays in shipment.

"Orders for only 80 to 90 pounds of tools came to us from companies 2,000 miles distant from our factory. This meant an immense freight item, in view of the fact that the weight of these small orders would not come close to making up the weight allowed under the minimum freight charge. Investigation of several hundred orders showed that an average of 12 per cent on the total cost of the tools could have been saved by the consumer had he been able to specify enough tools to make up the minimum required by the transportation companies.

"On these orders the matter of delivery time was ascertained and it was found that the average time from date of shipment to delivery was nine days, an item of considerable expense to the operating company in delay.

"We were, as a rule, so far away from the operating company that no accurate credit rating could be obtained. We, of course, used standard rating books but we found them ofttimes unable to do justice to either the operating company or to us, in view of the fact that the ratings shown were frequently those made a year previous. Many times no rating was shown.

"Special reports were out of the question for two reasons:

"First, the small amount involved would not warrant the expense; and second, the delay while securing this report. As a result of our not being able to handle these credits satisfactorily a considerable amount was annually charged off to profit and loss. A large percentage of this could undoubtedly have been recovered by suit but here again the small individual amount involved precluded the possibility of such action.

"After all was said and done, the one great underlying objection to selling or marketing tools direct was the lack of service.

"A large percentage of tool requirements are for emergency work and in any event, owing to the relatively small amount of tools used in comparison to such other items as poles, pole line hardware, and so forth, less consideration is given this matter by the storekeeper than on items of which large amounts are required. As a result tool requirements are not specified until the supply is exhausted and service is imperative.

"For these reasons the desired service cannot be obtained from the average manufacturer.

"Now, why can we arrange our prices to the jobber so that he can sell the goods to the consumer cheaper than we can sell them to him direct, to say nothing of the saving on the shorter less than carload freight haul? Let us summarize:

"First—Our selling expense outside of advertising is practically nothing.

"Second—The jobber can and does pack tools for shipment along with many other items of which the manufacturer has never even heard. The packing and shipping charge is divided between several items and the item of tools is only a small proportion of the whole.

"Third—We have no credit losses.

"These three items about cover the economic side of this proposition. Call the jobber a necessary evil if you wish, but the fact still remains that we could not market our tools to the ultimate consumer were it not for this very same jobber who minimizes our selling costs and takes all our credit risks.

"But putting aside all questions of an economic nature and getting down to the fundamental reason for the jobber's existence we come back to the one word 'service.' The jobber combs the country for standard electrical merchandise, buys it in the right market and maintains immense stocks in his warehouses for immediate shipment to his customers and can as a rule deliver material to them in an average time of two days. That's what counts in these 'high pressure' days."

The Holtzer-Cabot Electric Company issued an embossed invitation to its customers and the trade generally to visit its new building at 125 Amory street, Boston, Mass. (Roxbury district), on Tuesday, February 22, from 10 a. m. to 4 p. m.

United States Bureau of Standards scientific paper No. 252 is a technical treatise on Effective Resistance and Inductance of Iron and Bimetallic Wires, by John M. Miller, assistant physicist. It contains some 64 pages of text and illustration on the subject.

The North Dakota Telephone Association will hold its tenth annual convention March 28 and 29 at New Rockford. Programs will be available about March 15.

February 22 the Southern States Independent Telephone Association's North Carolina District held its first meeting at High Point, N. C., at the Elwood hotel. "Efficiency Through Co-operation" is the association's slogan. A very interesting meeting was held.

The man with the nerve gets the job; but the man with the ability leaves it for a better one.

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES.

DeWitt V. Moore, on January 15, resigned from the position of district engineer, division of valuation, Interstate Commerce Commission, with headquarters at Chicago, Illinois, to specialize in valuation work in a consulting capacity. Mr. Moore will give special attention to cost analysis. His experience covers ten years in railroad engineering, ten years in railroad and structural construction as engineer and contractor, and has been connected with the division of valuation since its organization in 1913.

Paul Sutcliffe has recently been appointed advertising manager of the Edison Storage Battery Company, Orange, N. J.

Miss Mayme Connor was given a reception by the local operators of the Indianapolis Telephone Company, Indiana, celebrating her thirteenth year with the company.

Robert F. Shurson, department manager of the Chicago Telephone Company at Joliet, Illinois, narrowly escaped death by drowning in the Farragut school natatorium. Mr. Shurson is one of the many employes of the company who belong to a swimming class and after some diving demonstrations by A. H. White, manager of the company, Mr. Shurson dived into eight feet of water; the shock taking his breath he sank twice and it was with some difficulty Mr. White brought him safely to the top.

B. F. Wasson, a well known figure in Illinois Independent telephone circles, died recently, and the state associations passed the following resolutions:

Whereas, B. F. Wasson, of Clinton, Illinois, was one of the pioneers in the Independent telephone movement in the United States, having been identified with such movement almost from its inception, and having contributed much to the solution of the many problems growing out of the same during the early years of the development of the Independent telephone business of this country, and

Wheras, on or about the 13th day of February, 1916, the said B. F. Wasson was called to his reward after having devoted a lifetime of service to the community in which he lived, and having contributed much to the cause of the Independent telephone industry, and

Whereas, we are desirous of expressing in some fitting manner our appreciation of the services rendered by the said B. F. Wasson to the cause that is nearest our own hearts,

Therefore, be it resolved by the Independent Telephone Association of Illinois and the McLean and DeWitt County Independent Telephone Association, that in the death of the said B. F. Wasson we have lost one of our most faithful and efficient co-workers and truest and best friends.

Resolved, further, that our esteem and heartfelt sympathy be extended to his bereaved wife and family.

Resolved, further, that a copy of this resolution be forwarded to Mrs. Wasson and other copies be furnished the telephone journals and local press with the request that the same be published.

W. W. Cox of Mapleton, Iowa, has been employed by the Farmers and Merchants Telephone Company as manager at Ireton.

E. Emerson has been appointed secretary-treasurer of the Mutual Telephone Company at Marshall, Illinois, succeeding Miss Hester Shipe, resigned.

Louis G. Gomez, consulting telephone expert for the Colorado public utilities commission, has been engaged as the American representative of the Australian government committee on public utilities. He will make an exhaustive report on the telephone situation in all parts of America, and, at the conclusion of his work with the Colorado commission, will go to Australia to study the telephone business there for the government. Mr. Gomez was given the appointment by Charles Mallory of Sidney, Australia, chairman of a party of Australian officials and financiers that is now in the United States studying telephone systems and leased telegraph wire service for the island government.

Miss Mamie Seiber, for fourteen years bookkeeper in the Wilmette exchange of the Chicago Telephone Company, has resigned and is succeeded by Miss Agnes Airey of the Blue Island exchange.

J. D. Taylor, wire chief for the Iowa Telephone Company at Fort Madison, has been transferred to the engineering department of the company at Des Moines. Mr. Taylor has been succeeded by A. G. Schmidt of Cedar Rapids.

Thomas White, wire chief for the New York Telephone Company at Newburg, has been promoted to district wire chief at Kingston. The district includes a wide area, embracing all of the territory between Hudson and Highland and extending to Liberty in Sullivan county.

Fred Snyder, who has been manager at Palisade, Colorado, for the Mountain States Telephone & Telegraph Company, has been transferred to Grand Junction, where he will take up his work immediately.

R. B. Frost, formerly chief clerk in the district plant chief's office of the Missouri & Kansas Telephone Company, Hutchinson, has resigned. A. A. Alexander has been transferred from Wichita to take his place.

NEWS FROM THE FIELD.

ARKANSAS.

The Clay County Co-operative Telephone Company of Piggott has surrendered its charter.

Repairing telephone lines out of Cotter, which were damaged by the flood, is in progress.

ARIZONA.

An entirely new plant will be erected in Tombstone by the Mountain States Telephone Company as announced by O. F. Teschnor and R. L. Burgess, officials of the commpany.

CALIFORNIA.

Considerable amount of damage was done in the San Joaquin valley when a terrific gale swept over the valley the latter part of January. Nearly half of the valley towns were completely without communication.

At the annual meeting of the stockholders of the East Side Rural Telephone Company held at Parlier, the following board of directors were relected: F. H. Stoker, W. J. Lohman, J. P. Hughes, H. B. Quick, James Hamilton, B. Tobiasen and J. F. Parlier.

A movement has been started for the installation of a farmers' telephone line to connect subscribers at Dobbins with the Oregon house, Stanfield Hill, Baxters, Dry Creek and other places.

COLORADO.

The annual report of President E. B. Field of the Mountain States Telephone & Telegraph Company, made to the stockholders at their annual meeting in Denver, February 8, shows a steady development in the service of the company throughout its operations in Colorado, New Mexico, Arizona, Wyoming, Utah, Montana, the western corner of Texas and all of Idaho excepting that portion north of the Salmon river. The report includes the operations of the Tri-State Telephone Company, a subsidiary of the major corporation. It was announced that the company will spend $3,950,000 in new plants and additions in 1916, of which amount $1,145,000 will be spent in the Eastern division, comprising Colorado.

ILLINOIS.

A new double switchboard is being installed at San Jose by the Forest City Telephone Company.

The Farmers and Merchants Telephone Company, Quincy, is putting in one thousand feet of cable and doing away with the open work in the city.

At the annual meeting of the telephone directors of the Citizens Telephone Company in Peoria the following directors were elected for the ensuing year: H. G. Herget, Jas. V. Barrett, John Fitzgerald, Arthur A. Sipfle and V. P. Turner. James Barrett was re-elected president.

The stockholders of the Lawn Ridge Telephone Company elected Charles W. Perkins, Grant Burdick and F. H. Cornell members of the board of directors and the following were elected officers: President, O. W. Hurd; vice-president, Theodore Roll; manager, Grant Burdick; secretary, and treasurer, F. H. Cornell.

Despite protests of many willing patrons, the Dixon Home Telephone Company is rebating a half month's phone rent to every subscriber because of the two weeks' loss of service due to the destruction by fire of the telephone exchange in the Countryman building, Dixon.

At a meeting of the stockholders of the Chicago Telephone Company, held February 9, the following were elected directors: U. N. Bethell, Alonzo Burt, D. Mark Cummings, Angus S. Hib-

bard, Marvin Hughitt, Chauncey Keep, Robert T. Lincoln, W. H. Miner, John J. Mitchell, B. E. Sunny, Theodore N. Vail.

A bureau of information and a switch board for the use of the various departments of city government located in the city hall, Springfield, will be installed about March 1.

The presidents of the farmers' telephone lines running into Astoria held a meeting in the Astoria State bank February 5 and elected F. P. Kays president and Cora Rumble secretary The new organization will be known as the Farmers' Mutual Telephone Exchange.

The Dixon Home Telephone Company plans to be located in its new two story structure at the corner of Second street and Peoria avenue, Dixon, the first of November with a complete new equipment which, together with the structure, will represent an expenditure of $75,000. Work will begin on the first of March and because of the destruction of the old exchange and the installation of a temporary exchange in the Schuler building will be rushed as fast as possible.

The Farmers' New Era Telephone Company held its annual meeting at Hebron and re-elected the following officers: President, George A. Hunt; vice-president, J. T. Bower; secretary and treasurer, F. N. Torrance; general manager, C. C. Hunt.

Cass County Telephone and Telegraph Company, Virginia; capital stock increased from $25,000 to $35,000.

C. F. Saunders of Elyria, Ohio, who has for the past two months been installing telephones in Morrison for the Morrison Telephone Company has completed the installation.

INDIANA.

The Commercial Telephone Company, Warsaw, redeemed $50,000 of its preferred stock.

Cumberland Telephone and Telegraph Company, a Kentucky corporation, has withdrawn from Indiana.

All of the old officers were re-elected at the annual meeting of the stockholders of the Home Telephone Company, held February 1 in the company's offices on West Franklin street, Elkhart. The officers are: President, Dr. I. W. Short, Elkhart; vice-president, H. B. Sykes, Elkhart; secretary and treasurer, W. L. Shoots, Goshen. The other members of the board of directors are Wilson Roose, Elkhart; W. C. Peters and Harris Oppenheim, Goshen, and Charles W. Miller, Indianapolis.

The Home Telephone and Telegraph Company, Fort Wayne, are installing new equipment, which when completed will bring the switchboard facilities and the trunking system between the south and main exchanges to a high degree of efficiency.

Morgantown Telephone Company, Morgantown, increased its capital stock $10,000, making the total capitalization $20,000.

Miss Margaret Bernhardt, of Indianapolis, traveling chief operator of the Independent telephone systems in Indiana, has arrived in Ft. Wayne and for the next few weeks will conduct a school for operators.

IOWA.

The Cedar Rapids and Marion Telephone Company may spend between $40,000 and $50,000 in improvement of the telephone service in Marion, if plans now contemplated are carried out. The installation of a complete new outfit in the building owned by the company at Marion is being considered by officials of the company with a change of all phones in the city from the magneto to the central energy system, the same as is in use in Cedar Rapids. The matter of the proposed improvements and the increase in rates to be asked will be presented to each individual subscriber and will be fully explained.

During a recent sleet storm one of the large cables of the Mount Ayr Mutual Telephone Company broke and the entire southeast part of the county was cut off from the county seat.

Fort Dodge telephone operators have been granted an increase in their wages.

The Western Electric Telephone Company in Mason City are contemplating the erection of a fire proof building to house the plant on East Fifth street.

A truck in the service of the Fort Dodge Telephone Company, Fort Dodge, was destroyed by fire when an employe held a lighted match over the gasoline tank to see how much gas was in it.

Washington's new telephone headquarters will be ready for occupancy in the spring. The building is two stories in height with basement, and the very latest devices in telephone service are being installed.

The anuual meeting of the stockholders of the Story County Independent Telephone Company was held at the offices of the company in Nevada. The officers and directors elected for the ensuing year are: M. C. Allen, president; F. S. Smith, vice-president; F. M. Boardman, secretary and manager, and H. G. Van Orsdel, treasurer. The board of directors are L. E. White, R. A. Frazier, Edw. M. McCall, J. A. King, Dr. P. Joor of Maxwell, Ben Johnson of Cambridge, and Jacob Ericson of Roland.

The annual meeting of the Farmers' Mutual Telephone Company was held in Sac City and the following officers elected for the year: A. A. Petersen, president; H. N. Renander, vice-president; Harry Dirrim, secretary; John S. Olander, treasurer.

KANSAS.

Considerable damage was done to the lines of the Peoples Home Telephone Company in Leavenworth by a recent sleet storm. Kansas City was the only toll line in operation.

A shallow sewer on Lawrence avenue has made it necessary for the Missouri & Kansas Telephone Company to make some changes in its plans for the building which it is to erect at Lawrence and First streets, Wichita. The original plans provided for placing a lot of the equipment in the basement, but this is impossible because the sewer at that point is only three and a half feet under ground and this would not afford drainage from the basement. The city engineering department is now at work on a plant for the telephone company, showing the location of all sewers, gas and water pipe and telegraph and telephone conduits in the vicinity of the site of the building.

Wilburton Telephone Company, Wilburton, $280,000.

Waterville Telephone Company, Waterville, $18,000.

The telephone company at Little River is putting in a new switchboard and improving the service.

The annual business meeting of the Suburban Telephone Company was held in Leavenworth February 8. The following officers were elected to serve for the ensuing year: President, William Freienmuth; vice-president, Thomas Martin of Linwood; secretary and treasurer, Foster Laming.

H. M. Evans of Kansas City, Missouri, has purchased the Home Telephone Company, which operates under franchises in Parsons, Pittsburg, Oswego, Chetopa, Bartlett, Altmont, Edna and Mound Valley. The basis for the sale of the holdings was made on a valuation of $126,000. L. W. Walker, of Parsons, will act as local manager.

Following a movement to organize a Mutual Telephone Company at Wathena and Troy and the subscribing for stock for this purpose at Wathena, the Northeast Kansas Telephone Company has announced that all subscribers here are now entitled to talk to any town in the country with the exception of Leona and White Cloud, free of charge. The conversation will be limited to three minutes but heretofore subscribers have been charged additional for such service.

KENTUCKY.

A local long distance telephone line from Whitesburg to Hindman, Knott County, a distance of twenty-six miles, is being contemplated by the Whitesburg Telephone Company.

The Cumberland Telephone & Telegraph Company will in a short time construct long distance lines through Elkhorn and Boone's Fork coal fields, passing through Whitesburg.

W. T. Gentry, president of the Cumberland Telephone and Telegraph Company, was re-elected chairman of the board at the annual meeting of the stockholders held in Louisville February 3. The following directors were re-elected: W. T. Gentry, J. Epps Brown and J. M. B. Hoxsey, of Atlanta, Ga.; J. W. Barr, Jr., Louisville; T. N. Vail, U. N. Bethell, C. H. Wilson and N. C. Kingsbury, of New York; James E. Caldwell, V. E. Schwab, William Litterer, W. W. Berry, W. S. Bransford, and W. R. Cole, of Nashville, Tenn.; J. S. Robinson, Memphis, Tenn.

Cannel City Telephone Company, Cannel City; capital, $380; incorporators, E. M. Walter, M. F. Nickell, S. P. Nickell and Eli Phipps.

MASSACHUSETTS.

The directors of the Middleburg Telephone Association elected the following officers at their annual election in Middleburg: President, Christopher S. Best; vice-president, Daniel D. Frisbie; secretary, Dow Beekman; treasurer and manager, Charles W. Vroman; attorney, George L. Danforth.

MICHIGAN.

Officers of the Grand Ledge Telephone Company, Grand Ledge, were re-elected at the annual meeting as follows: President, Clark Smith; vice-president, J. W. Ewing; secretary-treasurer and general manager, G. M. Every.

Since the city commission notified the two telephone companies operating in Owosso to remove all poles in the business section by July 1, a compromise has been offered by one company, the Union. This corporation, which is owned by local capitalists, agrees to make all the changes required if an extension is granted until the end of the year. Mayor DeYoung states the proposition will be extended.

The Lenawee County Telephone Company has moved into

its new home on Church street, Hudson. It is a one-story brick building with basement and has a lobby, business office, switchboard, terminal room, and rest room.

The Booster's club has named a committee to investigate the possibility of combining the two telephone exchanges in Charlotte to reduce the cost and increase the efficiency of the service.

Construction work on a new 200-pair cable to connect Lansing with East Lansing has been started by linemen of the Michigan State Telephone Company. The improvement represents an expenditure of $20,000.

MINNESOTA.

A new telephone line will be built to connect farms along the Rainy river to Wabanica, Hackett and Pitt. About twenty-five farm houses will be supplied by the line.

The Straight River Telephone Company of Medford held its annual meeting and re-elected the old board of directors, viz.: D. A. McKinlay, John Eskra, F. C. Webb, E. R. Webster and S. C. Turner, and in turn re-elected the old officers, E. R. Webster, president, and D. A. McKinlay, secretary and treasurer. The usual annual assessment of $5 each was levied on the members.

The Redwood County Rural Telephone Company, Redwood, held a very successful meeting which resulted in the following officers being elected: A. D. Stewart, president; J. M. Little, vice-president; H. A. Dryer, secretary; J. L. Lindeman, treasurer.

The Northwestern Telephone Company, in an amendment to its articles of incorporation filed with secretary of state Schmahl, increases its capital stock from $15,000,000 to $25,000,000.

The board of directors of the Manchester Farmers' Telephone Company held a meeting at Hartford. A new switchboard will be installed which will take care of the village and vicinity for some time to come. Oscar Johnston was appointed lineman.

The Citizens' Telephone Company in Mankota are distributing their new directories.

All the telephone lines in Lamberton have been placed in copper wire cables.

An increase in the general stock of the Northwestern Telephone Exchange Company from $15,000,000 to $25,000,000 has been authorized by directors of the company. This increase is to be used for additions and general improvements to the company's plants. Minneapolis will largely benefit by the improvements for most of the changes to be made will be in the local plant.

MISSOURI.

The Bell Telephone Society of St. Louis installed the following officers at their meeting held at the Mercantile Club: R. Eide, president; G. Calhoun, vice-president; W. L. Eastman, secretary and A. C. Bourscheidt, treasurer.

It is announced that the Missouri & Kansas Telephone Company is contemplating installing a cable line between St. Joseph and DeKalb. During the late storms many wires broke under the weight of the sleet and ice while the rural 'phones were put out of commission.

Fulton citizens are now using the new telephone system recently installed in that town.

The telephone line from Seligman to Cassville is now being completed and will be known as the Seligman Commercial line. The connection here has been made with the switch board of the Farmers' Co-operative Company.

MONTANA.

Division Manager R. F. Morris, of the Mountain States Telephone & Telegraph Company of Helena, held a meeting of the district managers of Butte, Great Falls, Helena and Billings, February 15. The development work of the company and the needs of Montana with reference to the installation of more exchanges were discussed. The Billings district includes northern Wyoming and on account of the discovery of oil considerable extension work was contemplated. Many division officials took part in the conference.

It has been reported that the extension of the toll line of the Mountain States Telephone Company from Roundup to Forsythe has been decided upon.

Manager Moore of the Moore Telephone and Telegraph Company, with headquarters in Glasgow, has announced that he will commence the construction of the Glasgow-Glentana line in the early spring. The line from Glasgow to Glentana will be about 60 miles in length, connecting with Baylor and other towns along the route. Headquarters for the northern Valley county line will be at Glentana.

NEBRASKA.

A toll of ten cents went into effect a short time ago to be charged to the subscribers of Kearney calling through the Riverdale exchange.

USE

ROEBLING

Double Galvanized
Telegraph and Telephone Wire
FOR

Strength and Durability
Heaviest Coat of Spelter
Highest Electrical Properties

Easy to String The Wire of Service

PRICES ON APPLICATION

John A. Roebling's Sons Company
TRENTON, N. J.

BRANCHES:
New York Boston Chicago Philadelphia Pittsburgh Cleveland
Atlanta San Francisco Los Angeles Seattle Portland, Ore.

The Peoples Telephone Company of Gordon have sold their stock to the Tri State Phone Company of Chadron.

The Nebraska Telephone Company purchased controlling interest in the Edgar Home Telephone Company. They have just completed the construction of a complete outside system, moving all poles to the alleys where possible.

February 1 the Chadron Telephone Company took over the Bordon exchange. This company now controls all the exchanges between Valentine, Nebraska, and Lusk, Wyoming, with the exception of four.

NEW JERSEY.

The contract for the erection of the new Bayonne telephone building on the northeast corner of Broadway and East Twenty-ninth street, Bayonne, has been filed and it is expected that by May the work will be completed.

NEW YORK.

The absorption of the New York State Telephone Company's lines by the Bell Company will remove from city streets in Elmira about 1,690 telephone poles. This announcement was made by local officials of the two companies and work of removing them will begin after the actual merger has been effected early in April.

At a meeting held January 25, the following officers were chosen by the recently reorganized Northwestern Telephone and Telegraph Company of Carthage: President, Hon. A. E. Kilby of Carthage; vice-president, M. S. Wilder of Watertown; secretary and treasurer, Burt H. Shephard of Syracuse; superintendent and assistant secretary and treasurer, Leslie H. Jenks of Carthage; auditor, Jesse E. Gay of Carthage.

The agents of the New York (Bell) Telephone Company have about concluded the canvass of the subscribers to the York State 'phone, the system which is to be absorbed by the Bell April 1. It is announced that practically none of the York subscribers have failed to continue their 'phone under the Bell service, and that all 'phone users in Elmira will benefit from a largely increased field to be reached by a single instrument.

Wire Chief J. M. Peterson, of the American Telephone and Telegraph Company, and A. J. Adams, his assistant, are in Elmira laying the local route for the new $3,000,000 long distance trunk lines of the company, from New York to Chicago. The actual work of installation in this section will be completed in about thirty days. This immense trunk line will relieve the strain on the present New York-Chicago lines.

NORTH DAKOTA.

Work of remodeling the old building of the Northwestern Telephone exchange at Jamestown is being held up on account of the material not arriving. The shipment consists of two carloads of material containing the switchboard and equipment. The installation of the switchboard is in the hands of the General Electric Company, and the work will be done by experts from Chicago.

OHIO.

The stockholders of the Amherst Home Telephone Company held a meeting recently for the purpose of taking action on increasing the capital stock and providing new equipment for the entire system. If this meets with the approval of the State Utilities' Commission the additional stock will be sold and the proceeds used in the installation of a new switchboard with a central energy system.

With 3,000 subscribers to the service of the Ohio State Telephone Company, the re-establishment of independent service in Zanesville was celebrated January 26 by a dinner at the Clarendon hotel, Zanesville, attended by telephone men of many cities.

The Coshocton County Telephone Company will expend $5,000 in repairing their lines it is reported.

The stockholders of the Greenville Home Telephone Company, Greenville, held their annual meeting and elected the following board of directors: Charles Leftwich, James A. Ries G. F. Schmermund, Lewis George, Conrad Kipp, S. A. Hostetter, B. P. Conkling and H. A. Rush, the last named a new member. The board of directors then organized by electing the following officers for the ensuing year: President, Chas. Leftwich; vice-president, J. A. Ries; treasurer, G. F. Schmermund; secretary and general manager, Conrad Kipp.

OHIO.

The automatic system was cut into service January 29 by the Ohio State Telephone system in Youngstown.

The board of directors of the Sycamore Telephone Company met and the following directors were elected: J. D. Curlis, J. L. Curlis, Chas. Oder, George Peenington, Cyrus Starkey, E. D. Case, Geo. Bartholomew, Ralph Dunlap, W. Baucher and O. P. Kraft.

OTTAWA.

The annual meeting of the assembly of Mutual Telephone Companies was held at Ottawa. The following are the newly elected officers for the year: Scott Whistler, Bluffton, president; P. A. Kemerer, Findlay, vice president: Cornelius E. Cortier, Delphos, secretary-treasurer. The following is the legislative committee: Henry Williams, Ottawa; C. C. McClure, Columbus Grove; P. A. Kemerer, Findlay.

The February issue of telephone directories are being distributed in Tiffin by the Tiffin Consolidated Telephone Company.

OHIO.

Telephone wires and cross arms have been removed from all of the Bell telephone poles on Main street in Zanesville, but the poles will remain for several months as they will be used to support trolley wires of the Ohio Electric Company until the new lighting system is installed.

The annual meeting of the stockholders of the Mt. Vernon Telephone Company was held on the eighth of February in Mt. Vernon at the building of the company on East Gambier street. The old board of directors was re-elected for the year. They are: Frank L. Beam, W. P. Bogardus, Harry C. Devin, P. S. Kelser, B. D. Herron, R. G. McClelland and E. O. Arnold. Owing to the illness of President Frank L. Beam, the board postponed the election of officers until the next meeting.

OKLAHOMA.

The Cottonwood Telephone Company, Cottonwood. Incorporators: J. W. Peoples, J. A. Brintle, H. T. Wanzor, J. W. Griffin, John Riggins, all of Mountain View. Capital stock $200.

The United Telephone Company which owns exchanges at Afton, Bernice, Cleora, Ketchum, Fairland and Grove has incorporated for $50,000. F. S. Miller is manager of the company.

OREGON.

In compliance with a request from the Albany Commercial Club officials of both the Bell and Independent Telephone Companies have signified their willingness to consider the consolidation of the two systems which are now maintained in this city. The date on which the matter will be taken up has not yet been set.

The Coquille Valley Farmers' line will be absorbed by the Coos & Curry Telephone Company.

PENNSYLVANIA.

Announcement has been made by officials of the Eastern Perry Telephone Company that they have sold their property to the Cumberland Valley Telephone Company for $10,025. The line extends from Montgomery's Ferry through Duncannon, Marysville, Enola and West Farview.

The Krumsville Rural Telephone lines which were out of services the past few weeks, on account of the storm and ice, are nearly all repaired.

Application of the Central District Telephone Company for approval of sale of real estate in the Twenty-first Ward, Pittsburgh, has been granted.

The proposition made by the Bell Telephone Company to the citizens of Bethel to build a loop line for the company for their telephone service was resented by them.

A mutual telephone company is being organized by the residents of Morning Sun.

The Long Distance Telephone Company is repairing its lines in lower Heidelberg.

The business offices of the Meadville Telephone Company have been transferred to the new home of the local plant, on Market street recently purchased by the company and the business will be conducted in the new location from now on.

SOUTH DAKOTA.

Reports made at the annual meeting of the stockholders of the Farmers' Mutual Telephone Company, which has its headquarters in Fairfax, show the company to be in a very flourishing condition. The following officers were elected: President, Otto Munson; vice president, Charles Woerpel; secretary-treasurer, W. A. Davis.

The board members of the Hurley Telephone Company held a meeting the early part of February and decided to disconnect lines 1 and 12 from the Freeman exchange.

TEXAS.

Corsicana now has only one telephone system, the Independent, or Corsicana Telephone Company having gone out of business.

The plan for consolidating the two telephone exchanges in Waxahachie has been approved by the Chamber of Commerce. A franchise to be submitted to the city council has been prepared.

UTAH.

The Mountain States Telephone & Telegraph Company has started active operations on the rebuilding of its exchange at Brigham City, having recently been granted a franchise by the city council. The plans for the rebuilding of the exchange call for an entirely new system with the exception of the instruments in use, which are standard.